SBC-S2416

User Manual

© 201112 IndusTech Ltd.

All Rights Reserved. No part of this document may be photocopied, reproduced, stored in a retrieval system, or transmitted, in any form or by any means whether, electronic, mechanical, or otherwise without the prior written permission of IndusTech Ltd..

No warranty of accuracy is given concerning the contents of the information contained in this publication. To the extent permitted by law no liability (including liability to any person by reason of negligence) will be accepted by IndusTech Ltd., its subsidiaries or employees for any direct or indirect loss or damage caused by omissions from or inaccuracies in this document.

IndusTech Ltd. reserves the right to change details in this publication without notice. Product and

company names herein may be the trademarks of their respective owners.

IndusTech Ltd.
P.O. Box 923
310018 Hangzhou, China
Tel: +86-571- 28110896
http://www.industech.com.cn
Fax: +86-571-28110896

Table of Contents

1 INTRODUCTION....9
1.1 About This Document....9
1.2 Related Documents....9
2 OVERVIEW....10
2.1 Highlights....10
2.2 Block Diagram....11
2.3 Features....12
3 SYSTEM COMPONENTS....14
3.1 DC Power Supply....14
3.2 Ethernet Connector....14
3.3 LVDS Transmitter....14
3.4 USB HOST Subsystem....15
3.5 WLAN Module....16
3.6 Audio Amplifier....17
3.7 Back-Up Battery....17
4 INTERFACES AND CONNECTORS....18
4.1 CoM-S2416 Interface Connectors (U1)....18
4.2 DC Power Jack (P1)....18
4.3 RS232 connector (J6/J9)....18
4.4 UART connector (J5/J10)....19
4.5 USB Slave Connector (J12)....19
4.6 USB Host Connector (J1)....19
4.7 USB Connectors (J2，J3)....20
4.8 Ethernet Connector (J7)....20
4.9 MMC/SD/SDIO Socket (J4)....21
4.10 LCD FPC (J13)....21
4.11 Touch-screen Headers (J14)....22
4.12 LVDS Header (J16)....22
4.13 Audio Jacks (J19, J20)....23
4.14 Miscellaneous Signals Headers (J11, J15)....23
4.15 GPIO Header (J8)....24
4.16 RTC Backup Battery Socket (BAT1)....25
4.17 Boot Source Jumper (S1,S2)....25
4.18 LED's (D6,D7,D8)....25
5 MECHANICAL DRAWINGS....26
6 OPERATIONAL CHARACTERISTICS....27
6.1 Absolute Maximum Ratings....27
6.2 Recommended Operating Conditions....27
6.3 DC Electrical Characteristics....27
6.4 Power Consumption....28
6.5 Operating Temperature Ranges....28
7 Software –Linux....29
7.1 Warning!....29
7.2 Establish Linux Development Environment....29
7.3 Load the Linux Images on the Board by the SD-card....29
7.3.1 Step1 – Burn the Linux Images into the SD-card....29
7.3.2 Step 2 –Load the Linux Images into the NAND Flash....31
7.4 Load the Linux Images on the board by the Ethernet....34
7.5 Make the Linux Images....39
7.5.1 Step1 – Establish the Cross Compilation Environment....39
7.5.2 Step2 – Make the U-boot Image....40
7.5.3 Step3 – Make the Linux Kernel Image....41

7.5.4 Step4 – Make the ROOT file system..... 43
7.6 How to.....44
7.6.1 After recompiling the system how to update it into the board..... 44
7.6.2 How to calibrate the touch screen in Linux..... 44
8 Software - Windows CE.....45
8.1 Warning..... 45
8.2 Load the WINCE Images into the NAND Flash.....45
8.2.1 Step1 – Create a SD-card.....45
8.2.2 Step2 – Load the Images into the NAND flash.....47
8.3 Make the WINCE Images.....52
8.3.1 Step1 – Establish the WINCE Development Environment.....52
8.3.2 Get the BSP.....53
8.3.3 Create a New Platform.....53
8.3.4 System Customization.....55
8.4 HOW TO.....57
8.4.1 How to change the LCD parameters.....57

Tables

Table 1 Document Revision Notes....7
Table 2 Board Revision Notes....8
Table 3 Related Documents....9
Table 4 SBC-S2416 Features....12
Table 5 Electrical, Mechanical and Environmental Specifications....13
Table 6 RF1 connector data....16
Table 7 802.11b/g (WLAN) RF system specifications....16
Table 8 802.11g EVM Requirement....17
Table 9 802.11b EVM....17
Table 10 Receiver....17
Table 11 5V DC input jack pinout....18
Table 12 P1 connector data....18
Table 13 J6/J9 connector pinout....18
Table 14 J6/J9 connector data....18
Table 15 J5 connector pinout....19
Table 16 J10 connector pinout....19
Table 17 J5/J10 connector data....19
Table 18 J12 connector pinout....19
Table 19 J12 connector data....19
Table 20 J1 connector pinout....20
Table 21 J1 connector data....20
Table 22 J2 connector pinout....20
Table 23 J3 connector pinout....20
Table 24 J2/J3 connector data....20
Table 25 J7 connector pinout....21
Table 26 J7 connector pinout....21
Table 27 J4 connector pinout....21
Table 28 J13 connector pinout....22
Table 29 J13 connector data....22
Table 30 J14 connectors pinout....22
Table 31 J16 connector pinout....23
Table 32 J16 connector data....23
Table 33 J20 connector pinout....23
Table 34 J19 connector pinout....23
Table 35 J19 and J20 connectors data....23
Table 36 J15 connector pinout....24
Table 37 J11 connector pinout....24
Table 38 J11/J15 connector data....24
Table 39 J8 connector pinout....24
Table 40 J8 connector data....24
Table 41 Boot Source Jumper Modes....25
Table 42 LED Description....25
Table 43 Operating Temperature Ranges....28
Table 44 WINCE 6.0 development environment software....52
Table 45 WINCE 6.0 Components Customization....56

Figures

Figure 1 SBC-S2416 Block Diagram....11
Figure 2 Power Scheme....14
Figure 3 Ethernet Scheme....14
Figure 4 USB Subsystem....15
Figure 5 SBC-S2416 top....26
Figure 6 SBC-S2416 bottom (X-Ray view - as seen from top side)....26
Figure 7....30
Figure 8....30
Figure 9....31
Figure 10....31
Figure 11....32
Figure 12....32
Figure 13....32
Figure 14....33
Figure 15....33
Figure 16....34
Figure 17....34
Figure 18....35
Figure 19....35
Figure 20....36
Figure 21....36
Figure 22....37
Figure 23....38
Figure 24....39
Figure 25....41
Figure 26....42
Figure 27....42
Figure 28....43
Figure 29....46
Figure 30....46
Figure 31....46
Figure 32....47
Figure 33....47
Figure 34....47
Figure 35....48
Figure 36....48
Figure 37....49
Figure 38....49
Figure 39....50
Figure 40....50
Figure 41....50
Figure 42....51
Figure 43....51
Figure 44....53
Figure 45....53
Figure 46....54
Figure 47....55

Table 1 Document Revision Notes

Date	Description
November 2009	First release
November 2011	Updated for SBC-S2416 1v1. For details, please refer to the “Board Revision Notes” table.

Please check for a newer revision of this manual at IndusTech's web site – http://www.industech.com.cn. Compare the revision notes of the updated manual from the web site with those of the printed or electronic version you have.

Table 2 Board Revision Notes

Date	Description
November 2009	Board revision 1v0. First release
November 2011	Board revision 1v1. Change the Mechanics of the board. Remove CAN transceiver and isolator. Added WLAN Module and RF connector. Added support for four additional USB2.0 ports. Added the USB hub Changed the supply power connector and DC value. Added 7 inch LCD support and LVDS connector. Added 7 inch LCD backlight power drive and four-channel power TCON support Fixed LVDS synchronization signal connection.

1 INTRODUCTION

1.1 About This Document

This document is part of a set of reference documents providing information necessary to operate and program IndusTech's SBC-S2416 baseboard.

1.2 Related Documents

For additional information not covered in this manual, refer to the documents listed in Table 3.

Table 3 Related Documents

Document	Location
CoM-S2416 Developer Resources	http://www.industech.com.cn

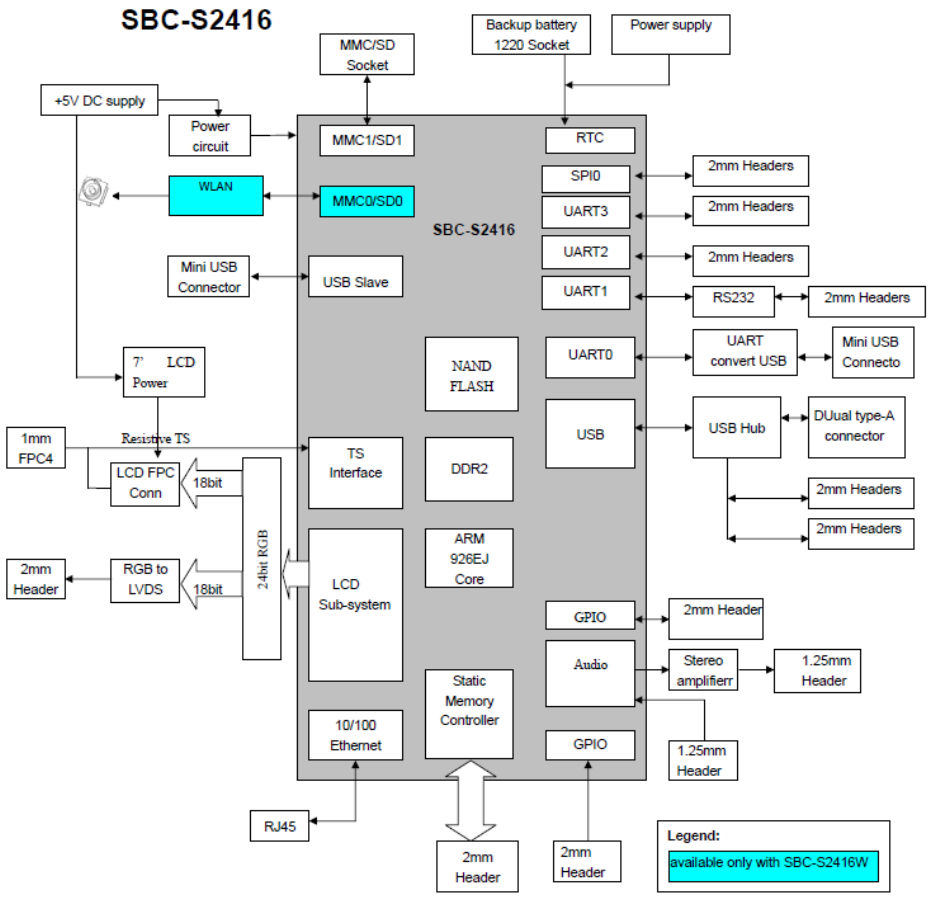
2 OVERVIEW

2.1 Highlights

● Carrier base-board designed to support the CoM-S2416 product line ● Implements a Single Board Computer when combined with a CoM-S2416 module. ● Extends the CoM-S2416 graphics controller with interfaces for LVDS, RGB and LCD ● WLAN support ● Up to 4 serial ports：two RS232 and two UART TTL ● Up to 4 USB 2.0 Host and one slave USB ports ● Touchscreen interface ● GPIO connectors ● Audio support with stereo amplifier output and mic input ● One 100 Mbps Ethernet ports ● MMC / SD / SDIO socket ● Back-up battery for RTC ● +5V Power DC input	The SBC-S2416 is a carrier baseboard designed for the IndusTech CoM-S2416 product line. The SBC-S2416 routes the CoM-S2416 interfaces to standard connectors and also enriches the CoM-S2416 feature set with additional peripheral devices. A combination of the SBC-S2416 with one of the CoM-S2416 modules implements a fully functional SBC (single board computer). The rich feature set of the SBC is customizable according to the price / performance targets of the user's application. The power supply options of the SBC-S2416 enable its integration in mobile applications powered by a rechargeable battery.

2.2 Block Diagram

Figure 1 SBC-S2416 Block Diagram



2.3 Features

The SBC-S2416 is a carrier baseboard designed for the IndusTech CoM-S2416 product line. This product line is based on the SAMSUNG ARM926EJ CPU.

A combination of the SBC-S2416 with a CoM-S2416 module is referred to as “SBC-S2416”.

Table 4 summarizes the features available with the SBC-S2416.

The "SBC Option" column specifies the SBC-S2416 P/N code that is required, in order to have the particular feature. The "CoM-S2416 Option" column specifies the CoM-S2416 P/N code that is required to have the particular feature. SBC-S2416 features are the combination of features provided by the attached CoM-S2416 module and the features implemented on the SBC-S2416. To have the particular feature, both the CoM and SBC options of that feature must be implemented.

"+" means that the feature is always available, regardless of P/N code.

"-" means that the feature is never available with the specific CoM-S2416 CoM, regardless of P/N code.

Table 4 SBC-S2416 Features

Feature	Specifications	SBC Option	CoM-S2416 Option
CPU SDRAM Flash Disk	See Feature List of the relevant CoM-S2416	+	
COM-1	Rx/Tx only, RS-232, DB9	+	+
COM-2	Rx/Tx only, RS-232, DB9 (for DEBUG)	+	+
COM-3	Rx/Tx only, TTL, 2-mm pitch header	+	+
COM-4	Rx/Tx only, TTL, 2-mm pitch header	+	+
Ethernet	CoM-S2416 100 Mbps Ethernet port, RJ-45 connector and activity LED's	+	E
LCD Panel	AT070TN92 (7”, 800x480, TFT) panel support. 50-pos FPC connector for direct interface to AT070TN92	+	+
LVDS	4 pair LVDS panel interface, 2-mm pitch header	LL	+
USB 2.0 Slave	USB 2.0 slave port, USB mini-B connector	+	+
USB 2.0 host	Two USB 1.1 host ports, 12Mbps. Dual type- A connector	+	+
	Two USB 1.1 host ports, 12Mbps. 2-mm pitch header	+	+
WLAN	WiFi IEEE802.11b/g module, USI WM-G-MR-09 module integrated on the SBC	W	+
GPIO	8 lines on 2-mm pitch header	+	+
Touch Panel	4-wire resistive panels connector. Interface to LCD panel	+	+

Sound I/O	I2S compliant audio codec, Line input and Speakers (stereo) jacks with amplifier	+	A
RTC Battery	supplied by lithium battery on SBC-S2416	+	+
SDIO / MMC	MMC / SD / SDIO support including SDHC up to 32GB. Standard full-size SD socket	+	+

Table 5 Electrical, Mechanical and Environmental Specifications

Supply Voltage	High efficiency switched power supply. regulated 5V from wall adapter
Power consumption	1W to 3W in full activity, depending on CPU speed and selected features Below 50mW in sleep mode
Dimensions	180 mm (L) x 80 mm (W) x 23 mm (H)
Weight	105 grams
Operation temperature (case)	Commercial: 0o to 70o C Extended: -20o to 70o C Industrial: -40o to 85o C
Storage temperature	-40o to 85o C
Relative humidity	10% to 90% (operation) 05% to 95% (storage)
Shock	50G / 20 ms
Vibration	20G / 0 - 600 Hz
MTBF	> 100,000 hours

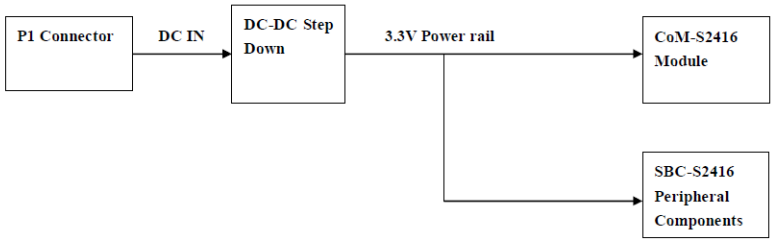
3 SYSTEM COMPONENTS

3.1 DC Power Supply

The SBC-S2416 DC power sub-system uses an external 5V DC power supply through connector P1. The SBC-S2416 generates a 5V power rail internally, using the TD1583 DC-DC step-down converter.

The various voltages required for powering SBC-S2416 peripherals are generated by on-board circuitry according to the block diagram below.

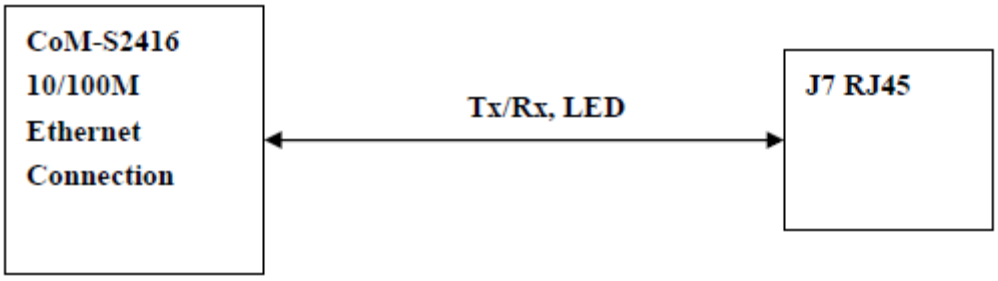
Figure 2 Power Scheme



3.2 Ethernet Connector

The SBC-S2416 Ethernet connector J7 is interface from CoM-S2416 Ethernet signal pins. Ethernet signals are routed to the RJ-45 connector (J7).

Figure 3 Ethernet Scheme



3.3 LVDS Transmitter

The SBC-S2416 is equipped with an LVDS Transmitter that is based on the DS90C363A IC. LVDS output signals are routed from the LVDS Transmitter IC to an onboard 2mm header (J16). The LVDS Transmitter is

connected to the display interface of the CoM-S2416.

The DS90C363A is a National Semiconductor +3.3V Programmable LVDS Transmitter 18-bit Flat Panel Display link-87.5MHz. The transmitter is fully compatible with the TIA/EIA-644 LVDS standard and supports VGA, SVGA and XGA display modes.

The LVDS Transmitter is configured for rising edge data sampling. GPH8 can be configured to put the transmitter into shutdown mode.

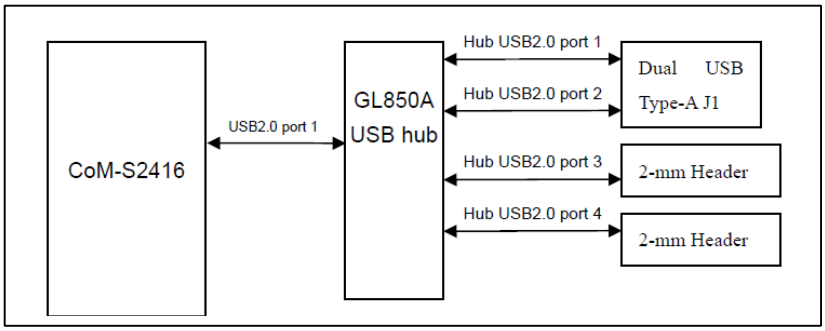
In order to use the LVDS interface, the CoM-S2416 display system has to be configured properly for 18bit active matrix data transmission.

3.4 USB HOST Subsystem

The SBC-S2416 provides four full-speed USB2.0 host ports implemented by USB hub GL850A chip which fully compliant with the USB 2.0 specification. The USB hub up-link is directly interfaced with the USB host port of the CoM-S2416. The USB hub provides four downlink connections routed directly to the dual type-A USB connector (J1).

The following block-diagram describes the SBC-S2416 USB subsystem.

Figure 4 USB Subsystem



3.5 WLAN Module

The SBC-S2416 incorporates full-featured 802.11b/g capabilities, implemented with the USI WM-BG-MR-09 WLAN controller module. The WM-BG-MR-09 is based on the Marvell 88W8688 chipset.

WLAN Standards supported:

- 802.11 data rates of 1 and 2 Mbps
- 802.11b data rates of 5.5 and 11 Mbps
- 802.11a/g data rates of 6, 9, 12, 18, 24, 36, 48, and 54Mbps for multimedia content transmission
- 802.11e Quality of Service (QoS)
- 802.11h DFS statistics processing
- 802.11h transmit power control
- 802.11j channels (Japan)
- 802.11s mesh networking

WLAN Security features:

- AES-CCMP hardware implementation as part of 802.11i security standard
- WPA (Wi-Fi Protected Access) encryption
- WEP 64- and 128-bit encryption with hardware TKIP processing
- IPSEC security acceleration in hardware

The WM-BG-MR-09 is connected to the CoM-S2416 via the MMC-2 port.

Antenna Connection

The WM-BG-MR-09 requires a single 2.45GHz antenna. The antenna is connected via the onboard UFL high frequency connector RF1. Any type of 2.45GHz antenna can be used.

Table 6 RF1 connector data

Manufacturer	Mfg. P/N	Mating Connector
Hirose	U.FL-R-MT(10)	Hirose U.FL-LP-040

Table 7 802.11b/g (WLAN) RF system specifications

Feature	Description
Frequency Band	2.4000 – 2.4835 GHz (2.4 GHz ISM Band)
Number of selectable Sub-channels	14 channels (f=2412+n*5 MHz, n=0,…,12; channel 14=2484MHz)
Modulation	OFDM, DSSS (Direct Sequence Spread Spectrum), DBPSK, DQPSK, CCK, 16QAM, 64QAM
Supported rates	1, 2, 5.5, 11, 6, 9, 12, 18, 24, 36, 48, 54 Mbps
Maximum receive level	- 10dBm (with PER < 8%)
Output Power	15 dBm +2.0 /-1.5 dBm for 1, 2, 5.5, 11Mbps 13 dBm +2.0 /-1.5 dBm for 6 , 9 and > 12Mbps
Carrier Frequency Accuracy	+/- 25ppm in 25ºC

Table 8 802.11g EVM Requirement

Item	Data rate (Mbps)	Relative constellation error (dB)	EVM (%RMS)
1	6 (BPSK)	-5	56.2
2	9 (BPSK)	-8	39.8
3	12 (QPSK)	-10	31.6
4	18 (QPSK)	-13	22.4
5	24 (16-QAM)	-16	15.8
6	36 (16-QAM)	-19	11.2
7	48 (64-QAM)	-22	7.9
8	56 (64-QAM)	-25	5.6

Table 9 802.11b EVM

Item	Data rate (Mbps)	EVM (%RMS)
1	1(BPSK)	35
2	2 (QPSK)	35
3	5.5 (QPSK)	35
4	11 (QPSK)	35

Table 10 Receiver

Receiver Characteristics	Typical (25ºC)	Maximum	Unit
PER <8%, Rx Sensitivity @ 1 Mbps	-97	-93	dBm
PER <8%, Rx Sensitivity @ 11 Mbps	-89	-85	dBm
PER <10%, Rx Sensitivity @ 6 Mbps	-91	-87	dBm
PER <10%, Rx Sensitivity @ 54 Mbps	-74	-68	dBm

For additional details, please refer to the USI WM-BG-MR-09 datasheet.

NOTE: The WLAN module is available only with the 'W' configuration option.

3.6 Audio Amplifier

The SBC-S2416 is equipped with a stereo audio out signal amplifier that is based on the CP2210 class-D audio power amplifier IC. Amplifier inputs are driven by the AUDIO_OUT_R/L signals of the CoM-S2416. Amplifier output is routed directly to the onboard headphone jack (J20).

The CP2210 is a 3W Stereo Power Amplifier from Chip Homer. The audio amplifier is capable of delivering 1.5W of continuous RMS power per channel into 8Ω loads and 3W power into 4 Ω loads.

The Audio amplifier is configured for a gain of 1V/V.

3.7 Back-Up Battery

An on-board 18mAh rechargeable coin cell lithium battery is the back-up power supply for RTC timekeeping. This battery is in charge of powering the CoM-S2416 RTC whenever the main power supply is not present.

4 INTERFACES AND CONNECTORS

4.1 CoM-S2416 Interface Connectors (U1)

The CoM-S2416 is interfaced through one 1.27mm pitch, 120pin connectors – U1. For signal descriptions, please refer to the relevant CoM Reference Guide.

4.2 DC Power Jack (P1)

Table 11 5V DC input jack pinout

Pin	Signal Name
1	VCC_5V
2	GND
3	GND

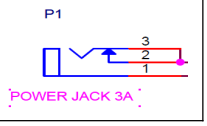


Table 12 P1 connector data

Manufacturer	Mfg. P/N
Astron	15-02037-R

Mating with power supply adapter 209C10020 supplied by IndusTech.

4.3 RS232 connector (J6/J9)

The UART0 and UART1 ports of the CoM-S2416 are power shift level from TTL to RS-232 by MAX3232CSE IC and connected to the SBC-S2416 on-board RS-232 standard DB9 male connector(J6/J9). All signals are at RS-232 levels.

Table 13 J6/J9 connector pinout

Pin	Signal Name	Pin	Signal Name
1	NC.	6	NC
2	RS232_RXD	7	NC
3	RS232_TXD	8	NC
4	NC	9	NC
5	GND		

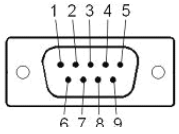


Table 14 J6/J9 connector data

Manufacturer	Mfg. P/N	Mating connector
Pinrex	982-11-P00012	Standard DB-9 Male connector

4.4 UART connector (J5/J10)

The UART2 and UART3 ports of the CoM-S2416 are connected to the SBC-S2416 on-board 2mm pitch header connector (J5/J10). All signals are at TTL levels.

Table 15 J5 connector pinout

Pin	Signal Name
1	VCC_5V
2	UART2_TX
3	UART2_RX
4	GND

Table 16 J10 connector pinout

Pin	Signal Name
1	VCC_5V
2	UART3_TX
3	UART3_RX
4	GND

Table 17 J5/J10 connector data

Manufacturer	Mfg. P/N	Mating connector
Pinrex	721-93-00-TW01	2mm pitch SMT wire to board header

4.5 USB Slave Connector (J12)

The USB Slave port of the CoM-S2416 is routed to the mini-USB type B connector (J12). For additional details, please refer to the relevant CoM Reference Guide.

Table 18 J12 connector pinout

Pin	Signal Name
1	USBD_ID
2	USBD_DM
3	USBD_DP
4	NC.
5	GND

Table 19 J12 connector data

Manufacturer	Mfg. P/N	Mating connector
Astron	22-2601-5G-1T-R	Standard USB mini-B plug

4.6 USB Host Connector (J1)

The two USB host ports provided by the on-board USB hub are routed to the standard dual type-A USB connector (J1).

Table 20 J1 connector pinout

USB HUB port 1		USB HUB port 2	
Pin	Signal Name	Pin	Signal Name
1	VCC_5V	5	VCC_5V
2	HUB_DM1	6	HUB_DM2
3	HUB_DP1	7	HUB_DP2
4	GND	8	GND

Table 21 J1 connector data

Manufacturer	Mfg. P/N	Mating connector
Astron	22-2104-8(W)-1T-R	Standard USB type A plug

4.7 USB Connectors (J2, J3)

The 2mm headers J2 and J3 are routed to USB ports 3 and 4 of the USB hub GL850A.

Table 22 J2 connector pinout

Pin	Signal Name
1	VCC_5V
2	HUB_DM3
3	HUB_DP3
4	GND

Table 23 J3 connector pinout

Pin	Signal Name
1	VCC_5V
2	HUB_DM4
3	HUB_DP4
4	GND

Table 24 J2/J3 connector data

Manufacturer	Mfg. P/N	Mating connector
Pinrex	721-93-00-TW01	2mm pitch SMT wire to board header

4.8 Ethernet Connector (J7)

The SBC-S2416 is equipped with a standard Ethernet RJ45 connector (J7) interfaced with the CoM-S2416 integrated Ethernet controller.

Table 25 J7 connector pinout

Pin	Signal Name
1	ETH_TXP
2	ETH_TXN
3	ETH_RXP
4	-
5	-
6	ETH_RXN
7	-
8	-

Table 26 J7 connector pinout

Manufacturer	Mfg. P/N	Mating connector
UDE	RTA-1D4B8V1A	Standard Ethernet RJ45 plug

4.9 MMC/SD/SDIO Socket (J4)

The SBC-S2416 MMC/SD/SDIO interface is based on the MMC-1 interface of the CoM-S2416. The MMC controller signals are routed to the standard MMC/SD socket (J4). For additional details, please refer to the relevant CoM reference guide.

Table 27 J4 connector pinout

Pin	Signal Name	Pin	Signal Name
1	MMC1_DAT3	9	MMC1_DAT2
2	MMC1_CMD	10	NC.
3	GND	11	MMC1_CD
4	VCC_3P3	12	GND
5	MMC1_CLK	13	GND
6	GND	14	GND
7	MMC1_DAT0	15	GND
8	MMC1_DAT1		

4.10 LCD FPC (J13)

The on-board LCD FPC connector (J13) allows easy integration with Annolux 7 inch AT070TN92 LCD panels. The CABFPC50 provides a generic 0.5mm header connection including the power for the LCD backlight and module logic voltages. For additional details, please refer to section *7* of this document.

Table 28 J13 connector pinout

Pin	Signal Name	Pin	Signal Name
1	VLED+	26	GND
2	VLED+	27	GND
3	VLED-	28	LCD_D23
4	VLED-	29	LCD_D22
5	GND	30	LCD_D21
6	VCOM	31	LCD_D20
7	VCC_3P3	32	LCD_D19
8	LCD_MODE	33	LCD_D18
9	LCD_DE	34	GND
10	LCD_VSYNC	35	GND
11	LCD_HSYNC	36	GND
12	VCC3_3	37	LCD_PCLK
13	LCD_D6	38	GND
14	LCD_D5	39	L/R
15	LCD_D4	40	U/D
16	LCD_D3	41	VGH
17	LCD_D2	42	VGL
18	GND	43	AVDD
19	GND	44	SYS_nRST
20	LCD_D15	45	NC.
21	LCD_D14	46	VCOM
22	LCD_D13	47	DITHER
23	LCD_D12	48	GND
24	LCD_D11	49	NC
25	LCD_D10	50	NC

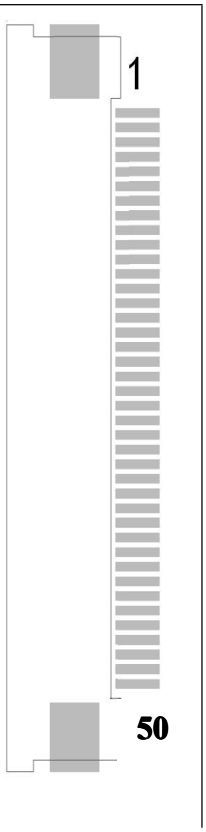


Table 29 J13 connector data

Manufacturer	Mfg. P/N	Mating connector
Pinrex	979-41-750200	FFC, 50 cont, 0.5mm

4.11 Touch-screen Headers (J14)

The on-board FPC4, 1mm pitch (J14) provides an easy way to interface with CoM-S2416 touch-screen interface.

Table 30 J14 connectors pinout

Pin	Signal Name	Pin	Signal Name
1	TS_X+	3	TS_X-
2	TS_Y+	4	TS_Y-

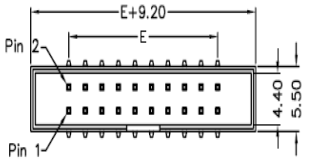
4.12 LVDS Header (J16)

LVDS output signals are routed from the LVDS transmitter IC to the onboard 2mm header (J16).

NOTE: The J16 connector does not provide power for the LVDS LCD panel and its backlight. External power source is required.

Table 31 J16 connector pinout

Pin	Signal Name	Pin	Signal Name
1	VCC_3P3	11	LVDS_P2
2	VCC_3P3	12	LVDS_N2
3	LVDS_P0	13	GND
4	LVDS_N0	14	GND
5	GND	15	LVDS_PCLK
6	GND	16	LVDS_NCLK
7	LVDS_P1	17	GND
8	LVDS_N1	18	GND
9	GND	19	LCD_BKL
10	GND	20	LCD_PWRDN



NOTE: J16 provides the backlight logic control signal and power down control signal by GPIO.

Table 32 J16 connector data

Manufacturer	Mfg. P/N	Mating connector
Pinrex	522-90-20-GB00	2.0mm Box header SMT-type

4.13 Audio Jacks (J19, J20)

The SBC-S2416 features two 3.5mm jacks, one for stereo headphone output (J20) and the other (J19) for mono audio input.

Table 33 J20 connector pinout

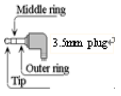
Pin	Signal Name	Mating plug pin	Jack pin-out	Mating plug
1	GND	Outer ring		
2	AMP_VOP	Middle ring		
3	AMP_VON	Tip		

Table 34 J19 connector pinout

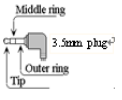
Pin	Signal Name	Mating plug pin	Jack pin-out	Mating plug
1	GND	Outer ring		
2	NC	Middle ring		
3	MIC_IN	Tip		

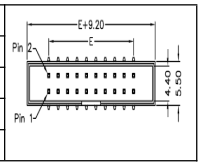
Table 35 J19 and J20 connectors data

Manufacturer	Mfg. P/N	Mating connector
Kycon	ST-3500-3N	Standard 3.5mm stereo plug

4.14 Miscellaneous Signals Headers (J11, J15)

The 2mm header (J15) provides access to some of the CoM-S2416 serial interfaces. These signals are routed through SBC-S2416 level shifters and operate at 3.3V voltage levels.

Table 36 J15 connector pinout

1	VCC_3P3	6	SPI0_SIMO	
2	VCC_3P3	7	SPI0_CS1	
3	I2C_SCL	8	SPI0_SOMI	
4	I2C_SDA	9	GND	
5	SPI0_CLK	10	GND	

The 2mm header (J11) provides access to some of the CoM-S2416 static memory control bus signals. These signals are routed directly from the CoM to J11 and operate at VCC_3P3 voltage levels.

Table 37 J11 connector pinout

Pin	Signal Name	Pin	Signal Name
1	VCC_3P3	13	SMC_A4
2	GND	14	SMC_A5
3	SMC_D7	15	SMC_A2
4	SMC_D6	16	SMC_A3
5	SMC_D5	17	GND
6	SMC_D4	18	SMC_A1
7	SMC_D3	19	SMC_nCS3
8	SMC_D2	20	SMC_nWE
9	SMC_D1	21	SMC_nOE
10	SMC_D0	22	SMC_nWAIT
11	GND	23	SMC_CLK
12	SMC_A6	24	SYS_nRST

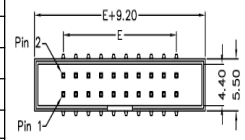


Table 38 J11/J15 connector data

Manufacturer	Mfg. P/N	Mating connector
Pinrex	522-90-24-GB00	2.0mm Box header SMT-type

4.15 GPIO Header (J8)

The 2mm header (J8) outputs eight GPIO signals of CoM-S2416.

Table 39 J8 connector pinout

Pin	Signal Name	Pin	Signal Name
1	VCC_3P3	6	GPG1:GPIO4
2	GPF5:GPIO0	7	GPG2:GPIO5
3	GPF6:GPIO1	8	GPG3:GPIO6
4	GPF7:GPIO2	9	GPG4:GPIO7
5	GPG0:GPIO3	10	GND

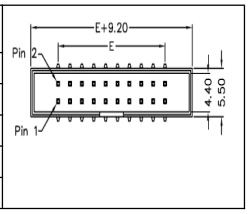


Table 40 J8 connector data

Manufacturer	Mfg. P/N	Mating connector
Pinrex	522-90-10-GB00	2.0mm Box header SMT-type

4.16 RTC Backup Battery Socket (BAT1)

The RTC backup battery socket should be assembled a CR1220 backup battery for normal operation. In the external DC Power on mode, the VCC_3P3 will supply for the RTC of CoM-S2416, but in the power off mode, RTC should be supplied by the backup power from on the baseboard. For additional details, please refer to the relevant CoM Reference Guide.

4.17 Boot Source Jumper (S1,S2)

The boot source jumpers control the boot sequence of the CoM-S2416. These jumpers are alternative to the "Boot Source" jumpers.

For additional details, please refer to the relevant CoM Reference Guide.

Table 41 Boot Source Jumper Modes

Jumper Position (Shorted pins)		Operating mode
S1	1 ---- 2	System software will be boot from NAND for CoM-S2416 v1.0 module System will be boot from MMC-1 for CoM-S2416 v2.0 module
S2	2 ---- 3	
S1	2- --- 3	System software will be boot from MMC-1 for CoM-S2416 v1.0 module System will be boot from NAND for CoM-S2416 v2.0 module
S2	1 ---- 2	

4.18 LED's (D6,D7,D8)

The table below describes SBC-S2416 LEDS.

Table 42 LED Description

LED	Color	System	LED activity
D6	Red	Power	Indicates that the 3.3V rail is active
D7	Green	System status	Indicates that the system is normal operation
D8	Green	WLAN status	Indicates that the WLAN module is link mode

4.18 BUZZER (LS3)

The SBC-S2416 features a buzzer routed GPF0 with CoM-S2416.

5 MECHANICAL DRAWINGS

Figure 5 SBC-S2416 top

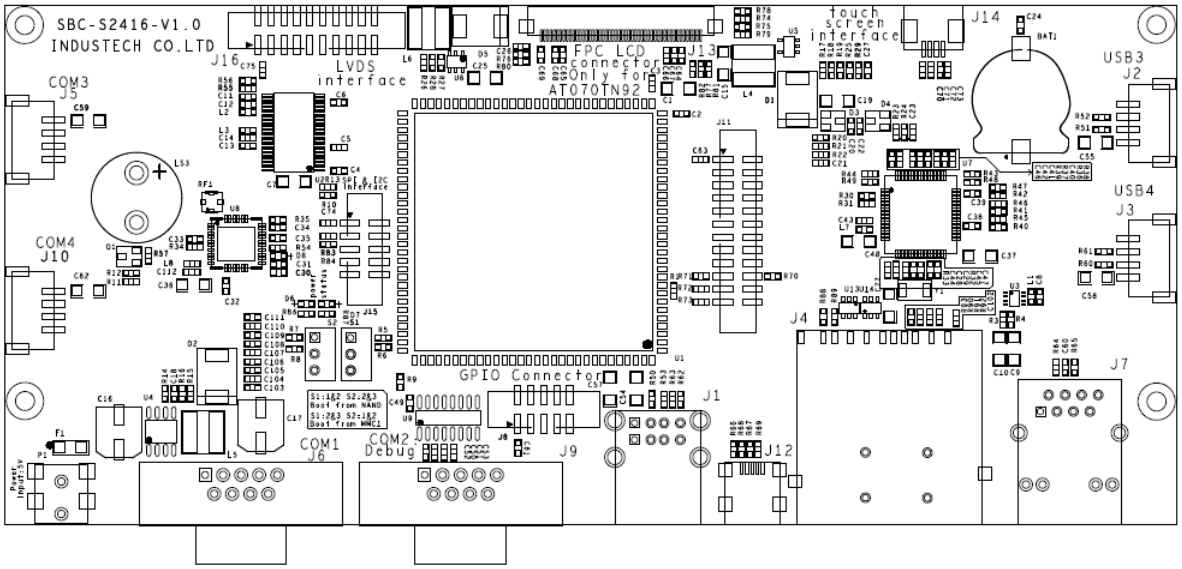
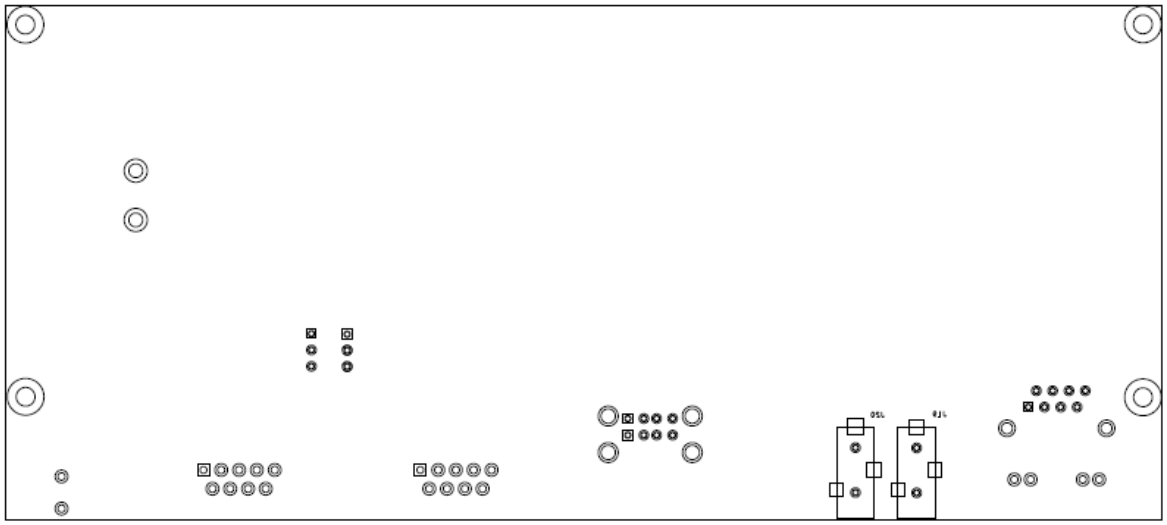


Figure 6 SBC-S2416 bottom (X-Ray view - as seen from top side)



Mechanical drawings are available in DXF format from CompuLab's website, following [Developer] >> [SBC-S2416] >> [SBC-S2416 - Dimensions and Connectors Location] links.

6 OPERATIONAL CHARACTERISTICS

6.1 Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit
Main power supply voltage	4.8	5	5.2	V

6.2 Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Main power supply voltage	4.8	5	5.2	V

6.3 DC Electrical Characteristics

Parameter	Operating Conditions	Min	Typ	Max	Unit
SD / MMC / SDIO					
V_{IH}	VCC_MMC = 1.8V	1.17		2.1	V
	VCC_MMC = 3.0V	1.875		3.3	
V_{IL}	VCC_MMC = 1.8V	-0.3		0.63	V
	VCC_MMC = 3.0V	-0.3		0.75	
V_{OH}	VCC_MMC = 1.8V	1.6			V
	VCC_MMC = 3.0V	2.25			
V_{OL}	VCC_MMC = 1.8V			0.2	V
	VCC_MMC = 3.0V			0.375	
1.8V Digital I/O					
V_{IH}		1.17		2.1	V
V_{IL}		-0.3		0.63	V
V_{OH}		1.4			V
V_{OL}				0.4	V
3.3V Digital I/O					
V_{IH}		2.145		3.3	V
V_{IL}		0		1.155	V
V_{OH}		2.9			V
V_{OL}				0.4	V
Display Interface					
V_{OH}	LCD_VIO = 3.3V	2.3			V
					V
V_{OL}	LCD_VIO = 3.3V			0.7	V
					V
I^2C (open drain with internal pull up to 1.8V)					
V_{IH}		1.26		2.3	V
V_{IL}		-0.5		0.54	V
V_{OH} (open drain with 3mA sink current)		0		0.36	V

RS232					
TX Voltage Swing		±5	±5.4		V
RX Voltage Swing			±25		V

6.4 Power Consumption

To be added in a future revision of this document.

6.5 Operating Temperature Ranges

The information in this section refers to the SBC-S2416 board only. For temperature ranges of off-board components such as the LCD panel or battery pack, please refer to the component's datasheet.

The SBC-S2416 is available with three options of operating temperature range:

Table 43 Operating Temperature Ranges

Range	Temp.	Description
Commercial	0° to 70° C	Sample boards from each batch are tested for the lower and upper temperature limits. Individual cards are not tested.
Extended	-20° to 70° C	Every board undergoes a short test for the lower limit (-20° C) qualification.
Industrial	-40° to 85° C	Every board is extensively tested for both lower and upper limits and at several midpoints.

7 Software –Linux

7.1 Warning!

Warning! Installing software is not easy. Finish the procedure completely and be patient to let the compilation and installation finish.

7.2 Establish Linux Development Environment

Before the development, you need to establish Linux development environment. If you are not familiar with this procedure, please refer to the corresponding documentations.

7.3 Load the Linux Images on the Board by the SD-card

There are two methods to load the Linux images into the NAND flash on the baseboard. One is used with SD-card, the other is used with Ethernet. This section will provide the operation steps to guide how to load the Linux images into the NAND flash by the SD-card. The Linux images and tools include following files:

- **moviNand_Fusing_Tool.exe** : The program on the PC is used to fuse the Linux images into the SD-card
- **DNW.exe:** The serial debug program the PC is used to communicate the baseboard by the serial cable.
- **tftpd.exe:** The FTP server on the PC is used to download the Linux images on the board by the TFTP
- **u-boot-movi.bin:** The SD-card Bootloader to boot the Linux kernel or write it into the NAND flash.
- **u-boot.bin:** The NAND flash Bootloader to boot the Linux kernel or write it into the NAND flash.
- **zImage:** The Linux Kernel of the baseboard includes drivers and components
- **uramdisk:** The Linux RAM file system
- **rootfs.tar.bz2**: The Linux ROOT file-system includes QT and other application program.

All above files can be downloaded from following location:
http://www.industech.com.cn/s2416/sbc-2416-linux.html
If you buy the EVM of the CoM-S2416, these bin files are located in the /Linux/IMG/ file folder on the CD-ROM and these tools are located in the /TOOLS/ folder.

7.3.1 Step1 – Burn the Linux Images into the SD-card

Note! The different symbols are used to express different environment between the PC and the baseboard.
#: indicates the command line on the baseboard
$: indicates the command line on the PC

1) Preparing a 2GB SD-card and plug it with an adapter into your computer. Make sure your SD-card

adapter can be normally used in your computer and select the Removable Disk as your device; you could format it with FAT32 file-system.

Figure 7

2) Double-click the **moviNand_Fusing_Tool.exe** program as follows.

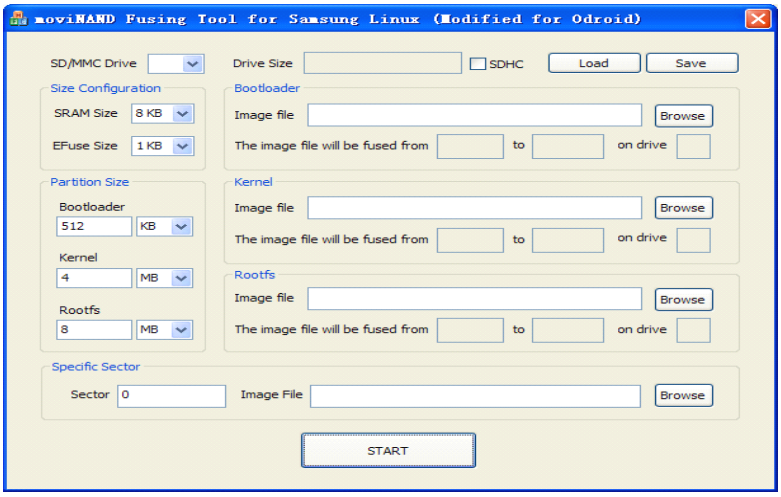
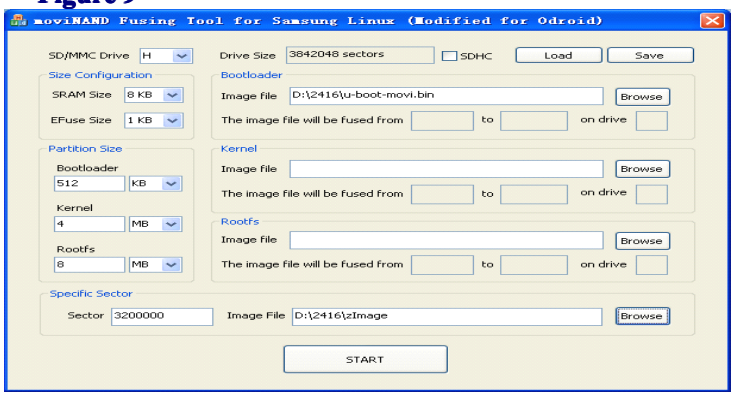


Figure 8

3) In the Figure 8, click the left of the **SD/MMC Drive**; Select the SD-card letter on your computer. For example, "Removable Disk J"
4) In the Figure 8, click **Browse** on the right of the **Bootloader**, select **u-boot-movi.bin** file in the IMG folder.
5) In the Figure 8, click **Browse** on the right of the **Specific Sector**, select **zImage** file, and type **3200000** into the sector.

All above operation is shown as following Fig.9

Figure 9

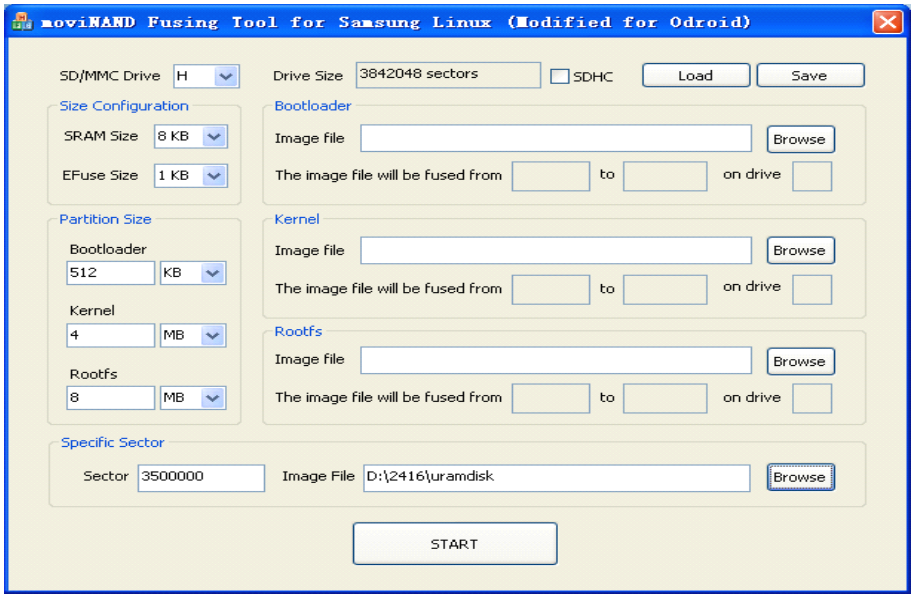


6) In the Fig.10, click '**START'** button, fuse above files into the SD-card until the message box pops up as following Fig. 10

Figure 10

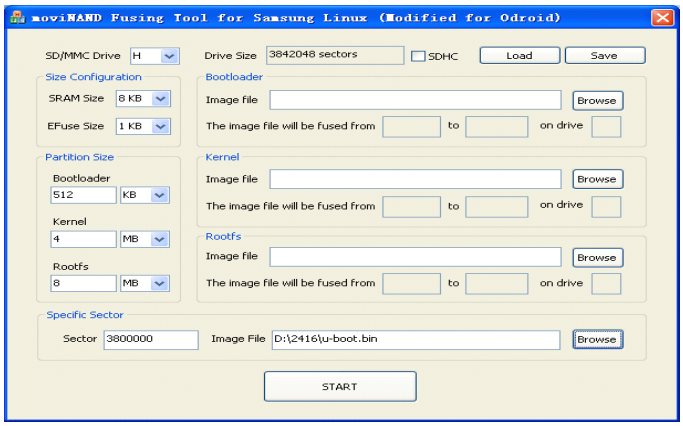
7) Reopen the **moviNand_Fusing_Tool.exe** software, and click the **Browse** button on the right of the **Specific Sector**, select **uramdisk** file, and type **3500000** into the Sector editor. Click the **START** button and burn the **uramdisk** into the SD-card successfully until the message box pops up

Figure 11



8) Click the **Browse** button on the right of the **Specific Sector**, select **u-boot.bin** file, and type **3800000** into the Sector editor. Click the **START** button and burn the **u-boot.bin** into the SD-card successfully until the message box pops up

Figure 12



9) Copy ‘rootfs.tar.bz2’ and ‘setup’ file into the SD card

10) Now, the Linux images have been burn into the SD-card successfully.

Note! The **moviNAND_Fusing_Tool** program allows the size of **zImage** is less than 2M bytes; otherwise, loading the kernel into the NAND flash must use the Ethernet mode

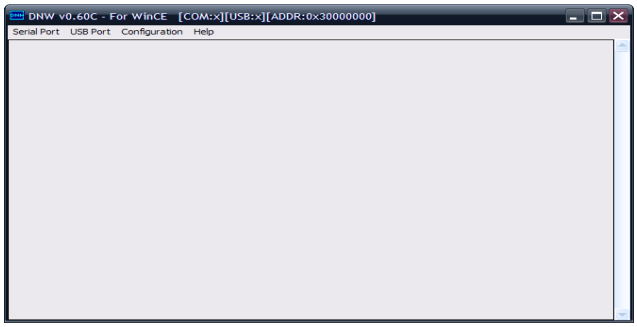
7.3.2 Step 2 –Load the Linux Images into the NAND Flash

Warning! This procedure will erase all the data in the NAND Flash.

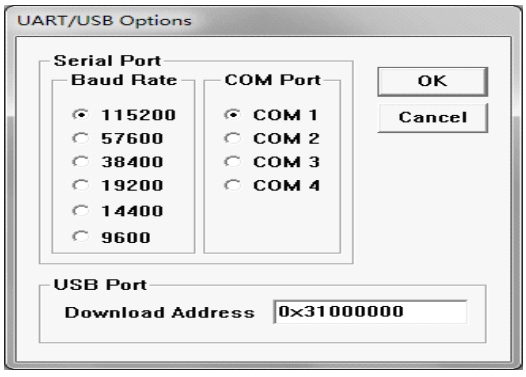
Before this procedure, some preparing steps have to be done as follows:

1) Make sure the present baseboard system is boot from MMC-1 instead of the NAND Flash before the system is power ON. So you have to set the S1/S2 jumpers to the right location. More details about the S1/S2 jumpers, please view 4.17 section in this document.
2) Connect the DB9 connector (J16 on the SBC-S2416) with your computer DB9 serial port by the serial cable.
3) Open the **DNW.exe** software as Figure 13.

Figure 13



4) Configure the DNW software and make sure the PC’s serial can be open normally:
[DNW->Configuration->Options]
Baud Rate: 115200 bps
COM port: COM1
Figure 14



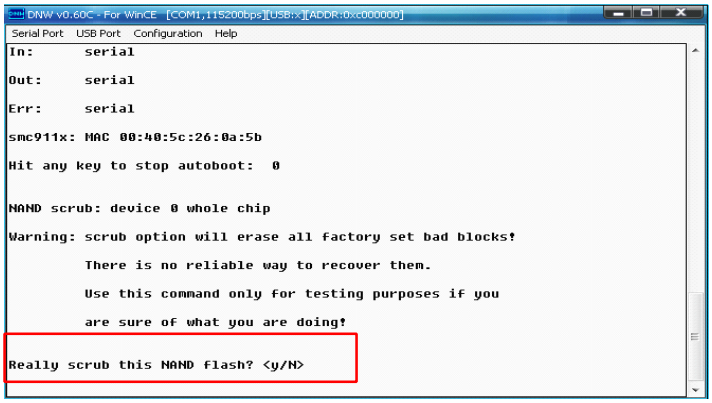
Click ‘OK’ to save the configuration and exit. In the menu, click [Serial Port -> Connect] to connect the

serial port.

When above preparing steps have been completed, the load procedure is beginning.

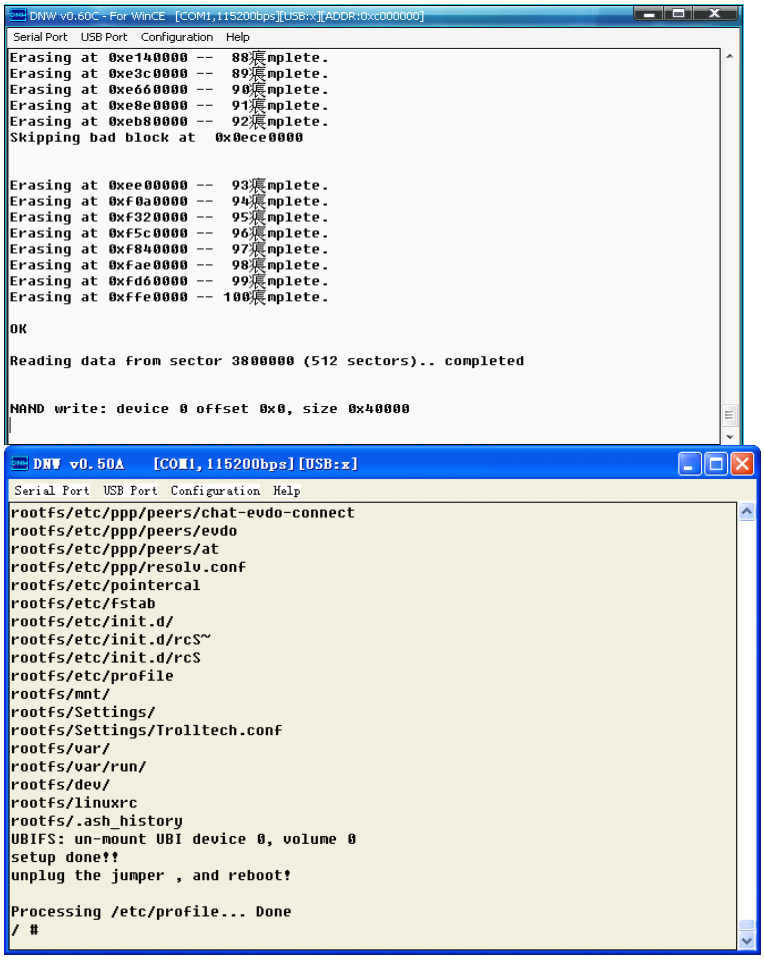
1) Insert the SD-card into the SD/MMC connector (J4) on the baseboard, then plug the power cable into the board, the Bootloader will boot from the SD-card and the information will be shown on the DNW program as follows.

Figure 15


DNW v0.60C - For WinCE [COM1,115200bps][USB:x][ADDR:0xc000000]
Serial Port USB Port Configuration Help
In: serial
Out: serial
Err: serial
smc911x: MAC 00:40:5c:26:0a:5b
Hit any key to stop autoboot: 0
NAND scrub: device 0 whole chip
Warning: scrub option will erase all factory set bad blocks!
There is no reliable way to recover them.
Use this command only for testing purposes if you
are sure of what you are doing!
Really scrub this NAND flash? <y/N>

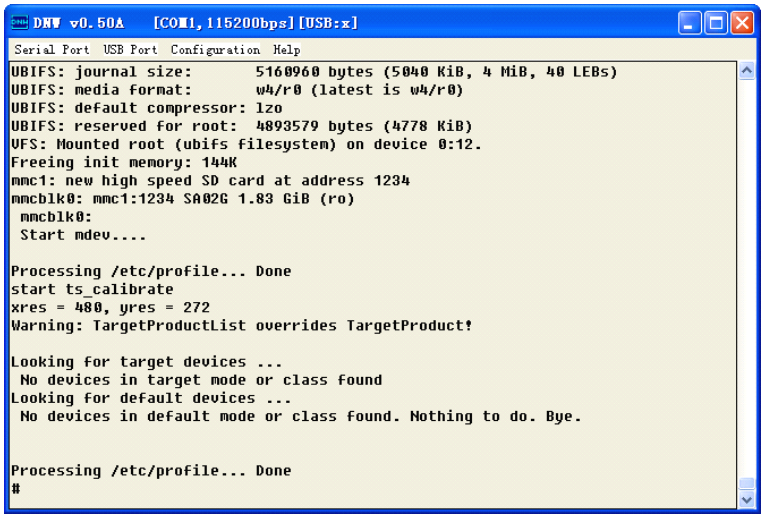
2) When the 'Really scrub this NAND flash?' characters appear, please push 'Y' key on the keyboard to erase all the NAND flash block on the board, the Linux Images on the SD-card will be automatically loaded into the NAND flash as following Figure 16.

Figure 16



3) Unplug the power cable; Change the S1/S2 jumpers' location to make sure the system is boot from NAND flash instead of MMC-1. Then plug the power cable into the board, the Bootloader will boot from NAND flash as following Figure 17.

Figure 17


DNW v0.50A [COM1,115200bps][USB:x]
Serial Port USB Port Configuration Help
UBIFS: journal size: 5160960 bytes (5040 KiB, 4 MiB, 40 LEBs)
UBIFS: media format: w4/r0 (latest is w4/r0)
UBIFS: default compressor: lzo
UBIFS: reserved for root: 4893579 bytes (4778 KiB)
VFS: Mounted root (ubifs filesystem) on device 0:12.
Freeing init memory: 144K
mmc1: new high speed SD card at address 1234
mmcblk0: mmc1:1234 SA02G 1.83 GiB (ro)
mmcblk0:
Start mdev....
Processing /etc/profile... Done
start ts_calibrate
xres = 480, yres = 272
Warning: TargetProductList overrides TargetProduct!
Looking for target devices ...
No devices in target mode or class found
Looking for default devices ...
No devices in default mode or class found. Nothing to do. Bye.
Processing /etc/profile... Done
#

7.4 Load the Linux Images on the board by the Ethernet

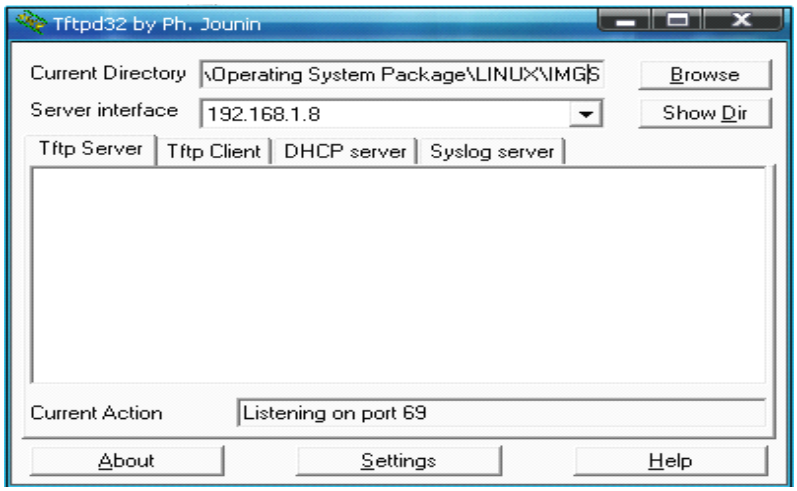
The Linux system can also be loaded directly from your computer with the Ethernet and burn it into the NAND flash. This section will provide the steps to guide how to operate it.

Before the procedure, make sure Bootloader on the NAND flash is not erased by all. If it has been erased, you have to insert the SD-card and then boot from it. Please see the 7.3.1. Here assuming the system is boot from the NAND flash.

1) Plug the network cable into the J7 connector on the board and connect it with the router or your computer directly.

2) Double-click the tftpd32.exe on your computer and set the [Current Directory] is the directory where all the Linux images stored.

Figure 18



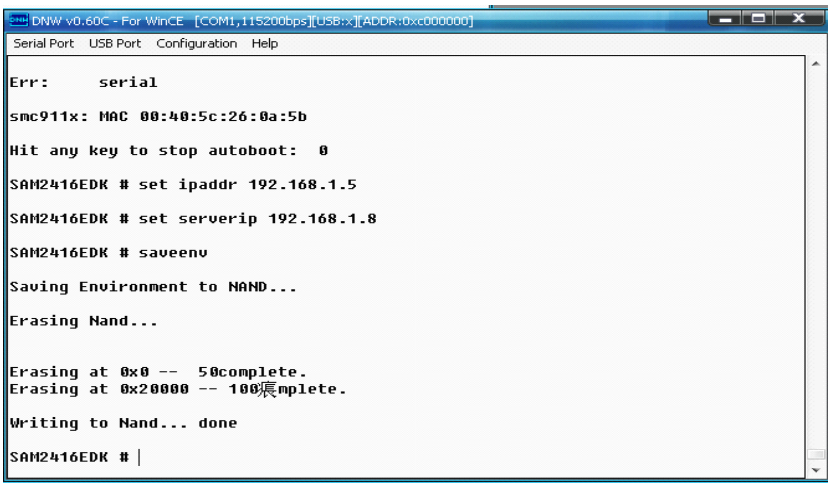
3) Plug into the power cable, reboot the board and quickly push the space key and let u-boot program into the u-boot command mode. set the board IP address and server address, ensure the IP address is the same network segment with your computer. For example:

 # setenv ipaddr 192.168.1.5 (the board IP address)

 # setenv serverip 192.168.1.8 (your computer IP address)

 # saveenv

Figure 19


DNW v0.60C - For WinCE [COM1,115200bps][USB:x][ADDR:0xc000000]
Serial Port USB Port Configuration Help
Err: serial
smc911x: MAC 00:40:5c:26:0a:5b
Hit any key to stop autoboot: 0
SAM2416EDK # set ipaddr 192.168.1.5
SAM2416EDK # set serverip 192.168.1.8
SAM2416EDK # saveenv
Saving Environment to NAND...
Erasing Nand...
Erasing at 0x0 -- 50complete.
Erasing at 0x20000 -- 100%complete.
Writing to Nand... done
SAM2416EDK #

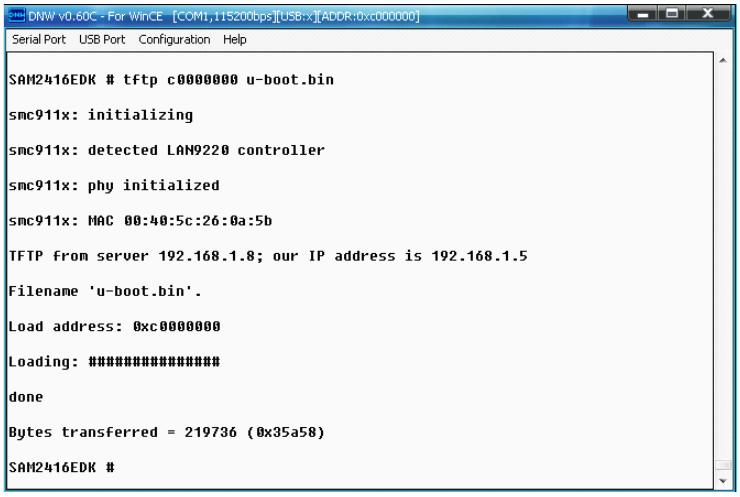
4) Download the u-boot.bin file and load it into the NAND flash

 # tftp 30000000 u-boot.bin

 # nand scrub

 # nand write 30000000 0 40000

Figure 20



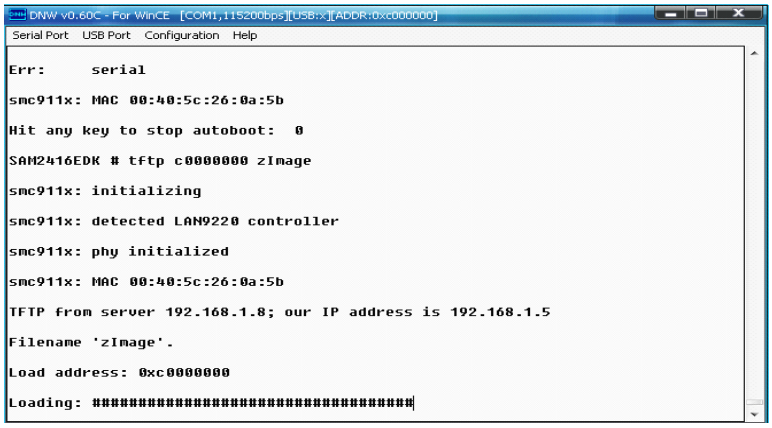
5) Download the zImage file and load it into the NAND flash

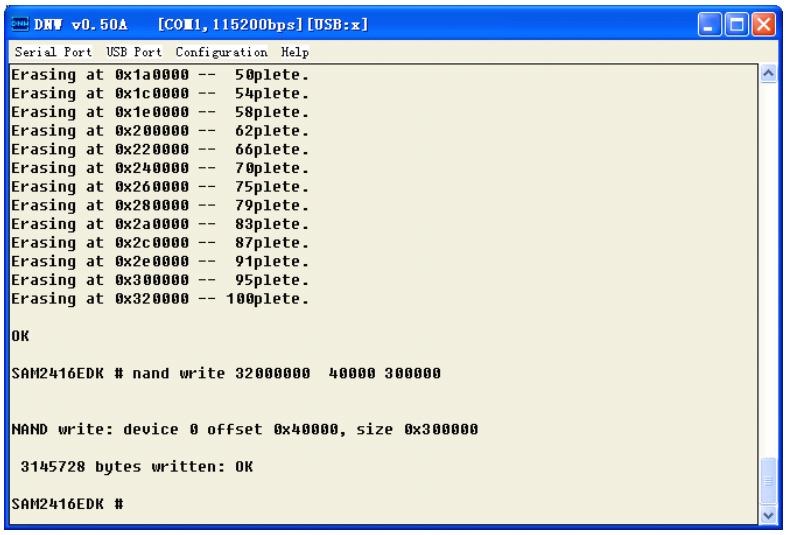
 # tftp 32000000 zImage

 # nand erase 40000 300000

 # nand write 32000000 40000 300000

Figure 21


DNW v0.60C - For WinCE [COM1,115200bps][USB:x][ADDR:0xc000000]
Serial Port USB Port Configuration Help
Err: serial
smc911x: MAC 00:40:5c:26:0a:5b
Hit any key to stop autoboot: 0
SAM2416EDK # tftp c0000000 zImage
smc911x: initializing
smc911x: detected LAN9220 controller
smc911x: phy initialized
smc911x: MAC 00:40:5c:26:0a:5b
TFTP from server 192.168.1.8; our IP address is 192.168.1.5
Filename 'zImage'.
Load address: 0xc0000000
Loading: ##################################


DNW v0.50A [COM1,115200bps][USB:x]
Serial Port USB Port Configuration Help
Erasing at 0x1a0000 -- 50plete.
Erasing at 0x1c0000 -- 54plete.
Erasing at 0x1e0000 -- 58plete.
Erasing at 0x200000 -- 62plete.
Erasing at 0x220000 -- 66plete.
Erasing at 0x240000 -- 70plete.
Erasing at 0x260000 -- 75plete.
Erasing at 0x280000 -- 79plete.
Erasing at 0x2a0000 -- 83plete.
Erasing at 0x2c0000 -- 87plete.
Erasing at 0x2e0000 -- 91plete.
Erasing at 0x300000 -- 95plete.
Erasing at 0x320000 -- 100plete.
OK
SAM2416EDK # nand write 32000000 40000 300000
NAND write: device 0 offset 0x40000, size 0x300000
3145728 bytes written: OK
SAM2416EDK #

Note!: Current NAND flash MTD is divided three different partitions:

- 0~40000: the first partition stores the Bootloader
- 40000 ~ 300000: the second partition stores the Linux kernel, the size is less than 4M Bytes.
- 300000 ~: the third partition stores the root file-system. the size is about 1000M bytes.

6) Use the SD card to copy the 'rootfs.tar.bz2' and 'setup' file from your computer and insert the SD card into the baseboard
7) Download the RAM file system: uramdisk and start it by kernel

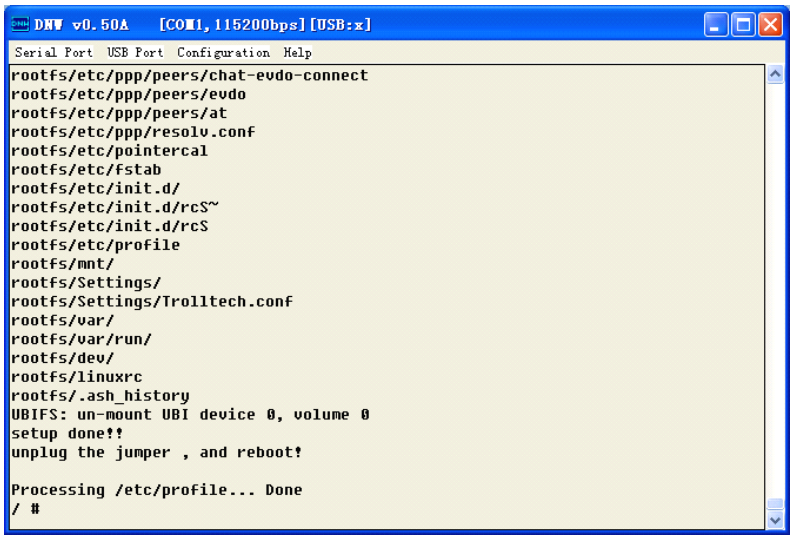
 # tftp 30800000 uramdisk

 # tftp 32000000 zimage

 # set bootargs root=/dev/ram rw console=ttySAC0,115200 init=/linuxrc

 # bootm 32000000 30800000

Figure 22



From Fig.22, the rootfs file system will be load into the NAND flash.

8) Unplug the power cable, then plug it into the board again to restart the system, the Linux system will be boot from the NAND flash.

7.5 Make the Linux Images

This section will provide the details about how to make the Linux images. This procedure includes following steps:

- How to establish the Linux cross compilation environment.
- How to make the SD-card Bootloader image: u-boot-movi.bin
- How to make the NAND flash ootloader image: u-boot.bin
- How to make the Linux kernel image: zImage

7.5.1 Step1 – Establish the Cross Compilation Environment

The first step to make above Linux images is to establish your Linux cross compilation environment. The cross compilation tool can be download from following location:
http://www.industech.com.cn/s2416/linux_tools.html
The current cross compilation version is cross-4.2.2-eabi, you can download the update version from Linux Open-source Forum: http://www.linuxforums.org/.

1) Make a file folder to store the cross compile tools

```
$ sudo mkdir /usr/local/arm
$ cp cross-4.2.2-eabi.tar.bz2 /usr/local/arm
$ cd /usr/local/arm
$ sudo tar xjvf cross-4.2.2-eabi.tar.bz2
```

2) Edit the bashrc file to notice Linux the compile location

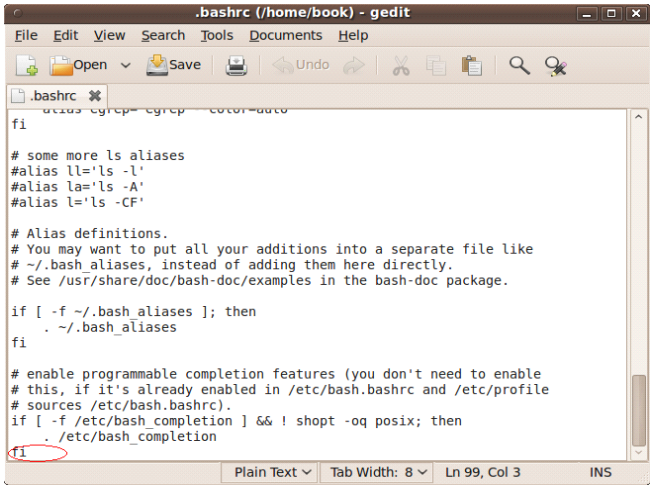
```
$ sudo gedit ~/.bashrc
```

Finding the end of all the lines, and add following codes:

```
export PATH=$PATH:/usr/local/arm/4.2.2-eabi/usr/bin
```

save it and exit as following Figure 23.

Figure 23


.bashrc (/home/book) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
.bashrc
fi
some more ls aliases
#alias ll='ls -l'
#alias la='ls -A'
#alias l='ls -CF'
# Alias definitions.
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.
if [-f ~/.bash_aliases]; then
. ~/.bash_aliases
fi
# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if [-f /etc/bash_completion] && ! shopt -oq posix; then
. /etc/bash_completion
fi
Plain Text Tab Width: 8 Ln 99, Col 3 INS

7.5.2 Step2 – Make the U-boot Image

This procedure will provide the details about how to make the Bootloader: u-boot-movi.bin and u-boot.bin

1) Make a project file folder in the root path to store the Linux source files
   $ sudo mkdir /sbc-s2416

   $ sudo chmod book:book /sbc-s2416 –R

2) Make a TFTP file folder in the root path to store the binary files
   $ sudo mkdir /tftp

   $ sudo chown book:book /tftp -R

3) Download the U-boot source code: u-boot.tar.bz2 from following location and store it in the sbc-s2416 folder: http://www.industech.com.cn/s2416/linux.html
4) Unzip the U-boot zip file package in the sbc-s2416 folder

   $ cd /sbc-s2416

   $ tar xjvf uboot.tar.bz2

5) Make the u-boot-movi.bin
   Enter sbc-s2416/u-boot/include/configs/, open the smdk2416.h header file with gedit editor as following command:
   $ cd /sbc-s2416/u-boot-1.3.4 /include/configs

   $ gedit smdk2416.h

   In the 363 line, revise two macro definitions:

   #define CONFIG_BOOT_NAND

   #define CONFIG_BOOT_MOVINAND

   If you want to make u-boot-movi.bin, you have to mask the first macro definition and reserve the second macro definition as follows
   //#define CONFIG_BOOT_NAND

   #define CONFIG_BOOT_MOVINAND

   Otherwise, if you want to make u-boot.bin, you have to mask the second macro definition and reserve

the first definition as follows

#define CONFIG_BOOT_NAND

//#define CONFIG_BOOT_MOVINAND

Save the smdk2416.h header file and exit. Return to the u-boot root file path, enter following commands to set the u-boot compile configuration and make it:

$ cd /sbc-s2416/u-boot-1.3.4

$ sudo make distclean

$ sudo make smdk2416_config

$ sudo make all

If the make procedure is successful, the u-boot.bin file will be generated in the TFTP folder
Delete this u-boot.bin file and run the mkmovi command to generate u-boot-movi.bin binary file:

$ rm /tftp/u-boot.bin

$ ./mkmovi

$ cp u-boot-movi.bin /tftp/

6) Revise the boot command to load the Linux images into the NAND flash automatically.
In the 378 line of smdk2416.h header file, you will find a macro definition:
CONFIG_BOOTCOMMAND which can load the Linux images into the NAND flash automatically. The load procedure can be changed by revising this command:

#define CONFIG_BOOTCOMMAND "sleep 1;nand scrub ;sleep 1;nand erase;sleep 1;movi read 3800000# 40000 30000000 ;sleep 1;nand write 30000000 0 40000;sleep 1;movi read 3200000# 300000 32000000;sleep 1;nand write 32000000 40000 300000;sleep 1;movi read 3500000# 300000 30800000;sleep 1;bootm 32000000 30800000"

7) Make the u-boot.bin.

The procedure to make the u-boot.bin binary file is the same with u-boot-movi.bin. the steps are listed as follows

#define CONFIG_BOOT_NAND

//#define CONFIG_BOOT_MOVINAND

$ cd /sbc-s2416/u-boot-1.3.4

$ sudo make distclean

$ sudo make smdk2416_config

$ sudo make all

7.5.3 Step3 – Make the Linux Kernel Image

1) Download the SBC-S2416 Linux kernel package from following location and store it in the sbc-s2416 folder: http://www.industech.com.cn/s2416/linux.html. Unzip this file package in the sbc-s2416 folder

$ cd /sbc-s2416

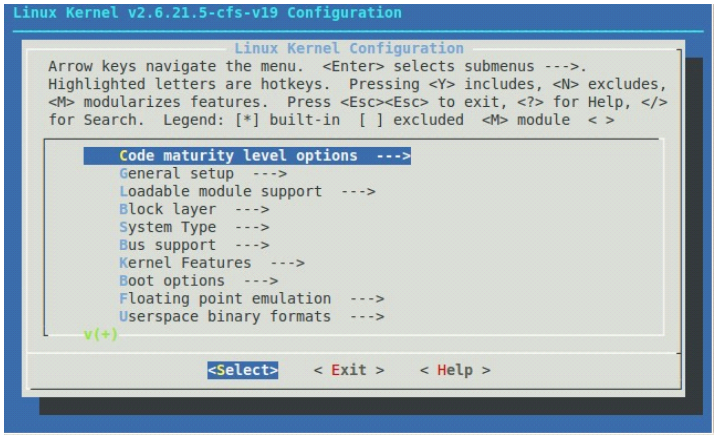
$ tar xjvf kernel.tar.bz2

2) Set the kernel configuration parameters

$ cd /sbc-s2416/kernel

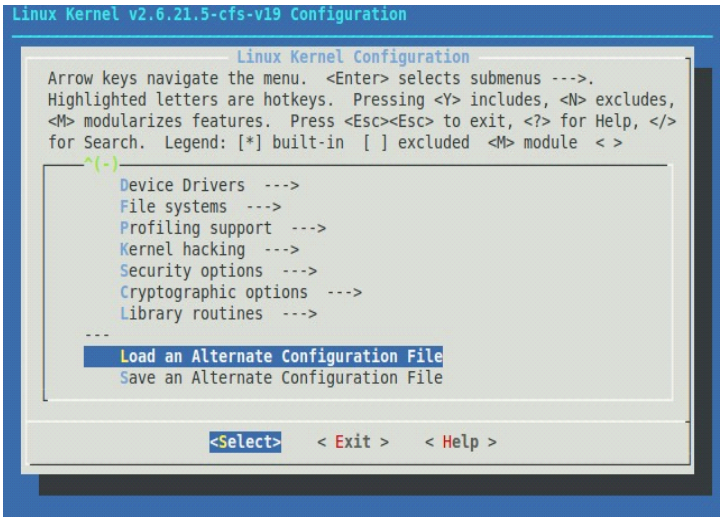
$ make menuconfig

Figure 24


Linux Kernel v2.6.21.5-cfs-v19 Configuration
Linux Kernel Configuration
Arrow keys navigate the menu. <Enter> selects submenus --->.
Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes,
<M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </>
for Search. Legend: [*] built-in [ ] excluded <M> module < >
Code maturity level options --->
General setup --->
Loadable module support --->
Block layer --->
System Type --->
Bus support --->
Kernel Features --->
Boot options --->
Floating point emulation --->
Userspace binary formats --->
v(+)
<Select> < Exit > < Help >

3) Down it by using the arrow key and select the 'Load an Alternate Configuration File', push the enter key on the keyboard as follows

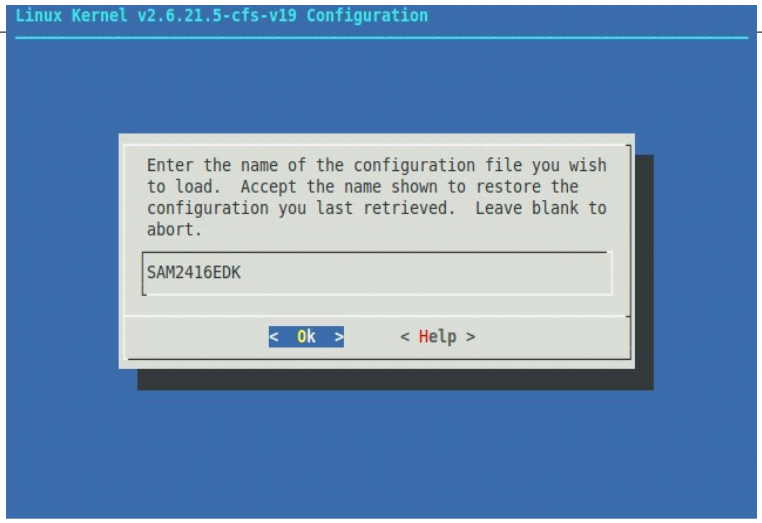
Figure 25


Linux Kernel v2.6.21.5-cfs-v19 Configuration
Linux Kernel Configuration
Arrow keys navigate the menu. <Enter> selects submenus --->.
Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes,
<M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </>
for Search. Legend: [*] built-in [ ] excluded <M> module < >
^(-)
Device Drivers --->
File systems --->
Profiling support --->
Kernel hacking --->
Security options --->
Cryptographic options --->
Library routines --->

Load an Alternate Configuration File
Save an Alternate Configuration File
<Select> < Exit > < Help >

4) Type 'sbc-s2416', click 'OK' and exit from it until configuration graphic as follows

Figure 26


Linux Kernel v2.6.21.5-cfs-v19 Configuration
Enter the name of the configuration file you wish to load. Accept the name shown to restore the configuration you last retrieved. Leave blank to abort.
SAM2416EDK
< Ok >
< Help >

5) Make the kernel image

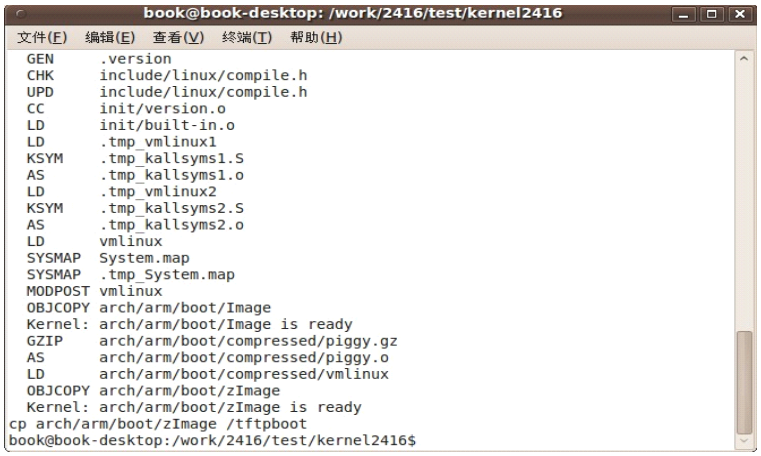
$ cd /sbc-s2416/kernel

$ make clean

$ make zImage

6) If the making procedure is successful, the zImage file will be generated in the TFTP file folder as follows:

Figure 27



Note! The Linux kernel includes only some necessary components in this procedure. If you want to include other components, please make menuconfig to select.

7.6 How to

7.6.1 After recompiling the system how to update it into the board?

In the previous section 7.5, the Linux images including u-boot.bin, zImage and rootfs.yaffs can be loaded by the

Ethernet. Therefore, once the system has been generated, you can use the Ethernet mode to download it and update the board. Certainly, you have to install the TFTP server on your Ubuntu computer as follows:

1) Download the tfpt server package, tftp client package and xinetd package and install it

```
$ sudo apt-get install tftpd tftp xinetd
```

2) Create /etc/xinetd.d/tftp file and add following codes into it:

```
service tftp
{
protocol = udp
port = 69
socket_type = dgram
wait = yes
user = nobody
server = /usr/sbin/in.tftpd
server_args = /tftp
disable = no
}
```

3) Set the tftp directory as the tftp server root directory

```
$ sudo chmod –R 777  /tftp
$ sudo chown –R nobody /tftp
```

4) Start the tftpd server by the xinetd super-server

```
$ sudo /etc/init.d/xinetd start
```

OK, the tftp server has been install on your computer, you can download all Linux images into the board and update it. More details, please refer to the section 7.4

7.6.2 How to calibrate the touch screen in Linux

Plug the power cable into the board and boot the system into the Linux console. Open the DNW software on your computer (or other terminal software), type following commands:

 # ts-calibrate (Touch the crosses that appear on the screen)

 # killall

 # Xorg

 # poweroff (to save settings)

8 Software - Windows CE

8.1 Warning

Warning! Installing software is not easy. Finish the procedure completely and be patient to let the compilation and installation finish.

8.2 Load the WINCE Images into the NAND Flash

Generally, the default factory system is the Linux in the NAND flash of the baseboard. Therefore, you have to load the WINCE images into the NAND flash if you want to use WINCE as the development environment. The WINCE images and fusing tool include following files:

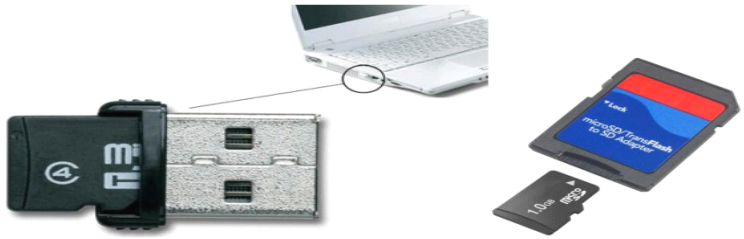
- **IROM_Fusing_Tool.exe**: the program is used to fuse the Bootloader into the SD-card (only for XP)
- **DNW.exe**: the serial debug program is used to show the board details on the computer
- **DNW USB Download Firmware:** the USB drivers of the PC is used to download the files on the baseboard from computer (only for XP).
- **IROM_SD_EBOOT.nb0**: the SD-card Bootloader is used to boot the WINCE kernel or load it into NAND flash
- **STEPLDR.bin**: the first NAND flash Bootloader is used to boot the EBOOT.bin
- **EBOOT.bin**: the second NAND flash Bootloader is used to boot the WINCE kernel
- **XIP.bin**: the WINCE kernel image
- **SMDK2416:** the SBC-S2416 CE 6.0 BSP software package.

All above files can be download from IndusTech's website:
http://www.industech.com.cn/s2416/
The SMDK2416/TOOLS file folder includes DNW.exe, DNW USB Download Firmware, IROM_Fusing_Tool.exe.
This section will guide how to fuse the WINCE images into the NAND flash on the board

8.2.1 Step1 – Create a SD-card

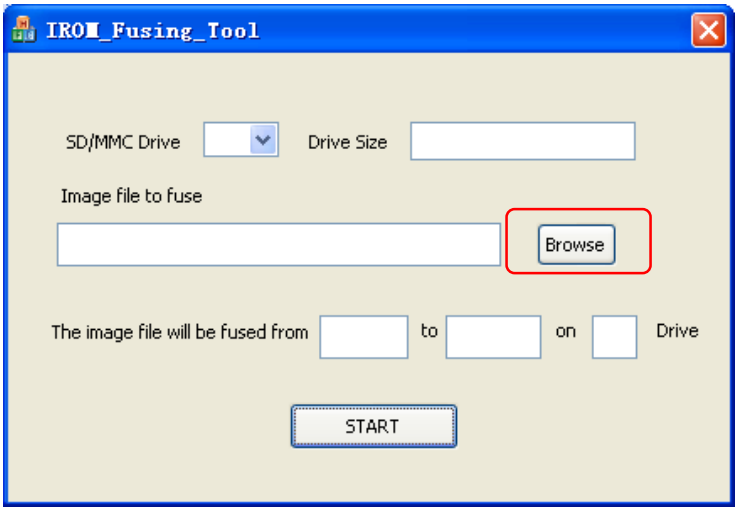
1) Preparing a 2GB SD-card and plug it with an adapter into your computer. Make sure your SD-card adapter can be normally used in your computer and select the Removable Disk as your device; you could format it with FAT32 file-system.

Figure 28



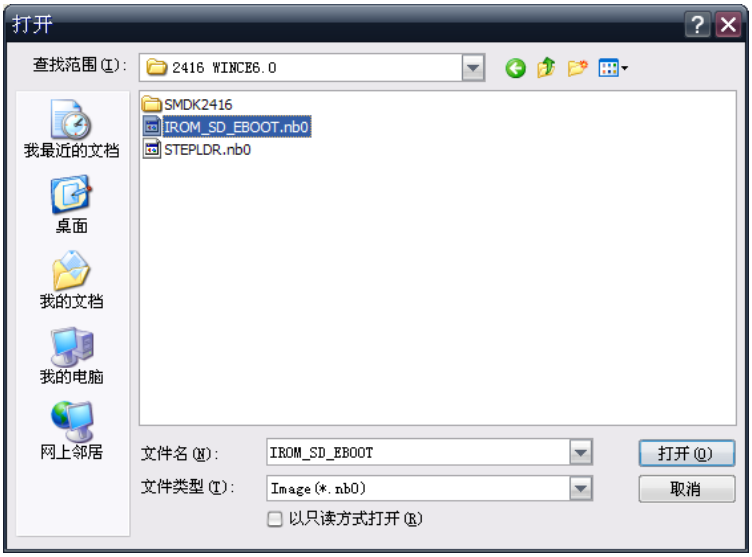
2) Double-click the IROM_Fusing_Tool.exe as follows.

Figure 29



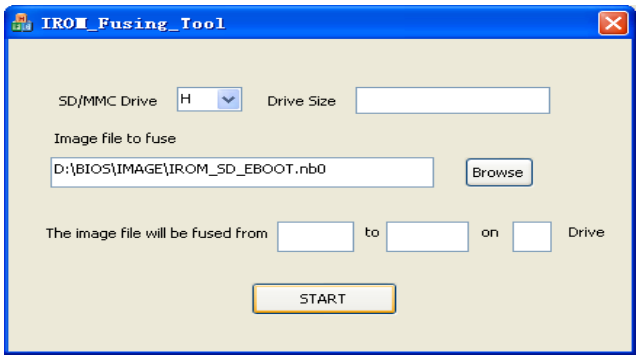
3) Click 'Browse' button and select the IROM_SD_EBOOT.nb0 file in the WINCE images folder as follows:

Figure 30



4) Click 'SD/MMC Drive' and select the Removable Disk letter on your computer, for example: H

Figure 31



5) Click 'START' button to fuse the IROM_SD_EBOOT.nb0 into the SD-card until the windows message box pops-up.

Figure 32

6) Unplug the SD-card from the SD-card adapter and insert it into the connector J4 on the baseboard.

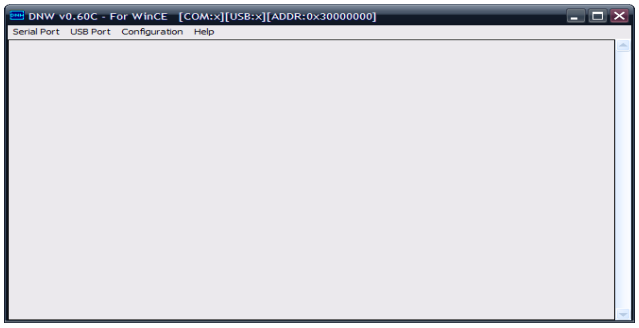
8.2.2 Step2 – Load the Images into the NAND flash

Warning! This procedure will erase all the data that is present in the NAND Flash.

Before this procedure, some preparing steps have to be done as following:

1) Make sure the system is boot from MMC-1 instead of NAND Flash. So you have to set the S1/S2 jumpers to the right location. More details about the S1/S2 jumpers, please view 4.17 section in this document.
2) Connect the baseboard's serial connector (J6 on the SBC-S2416) with PC's serial port by the serial cable (If your computer has no any serial port, you have to buy the UART->USB translator).
3) Connect the board's USB slave connector (J12 on the SBC-S2416) with PC's USB port by the USB cable.
4) Open the DNW.exe program and set it's configuration as follows.

Figure 33



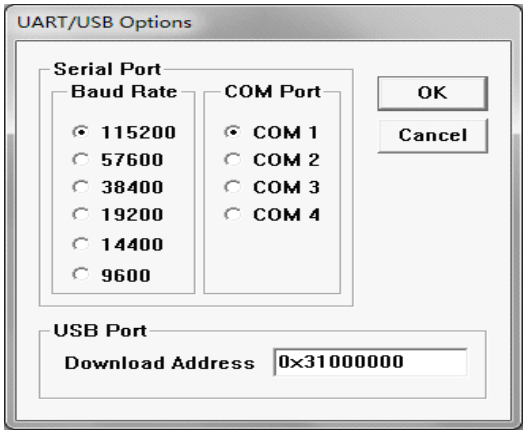
5) Configure the DNW software as follows:

[DNW->Configuration->Options]

Baud Rate: 115200

COM port: COM1 (your computer serial number)

Figure 34

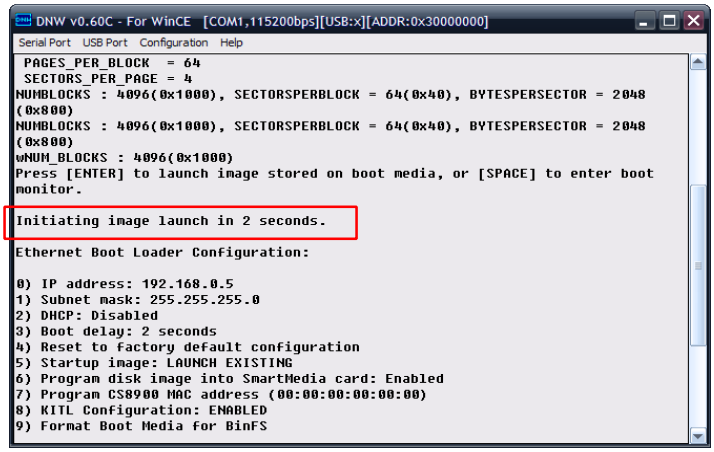


Click 'OK' to save the configuration and exit. In the menu, click [Serial Port -> Connect] to open the serial port.

When above preparing steps have been over, the installing procedure begin.

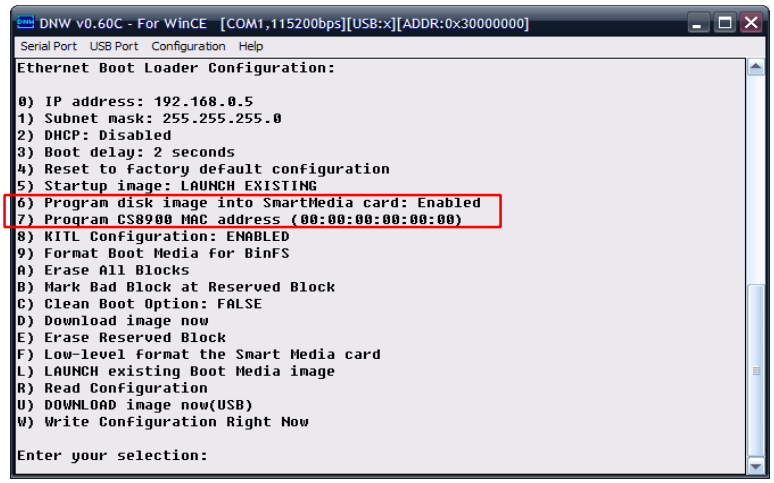
1) Plug the power cable into the baseboard, the Bootloader will boot from the SD-card and the information will be shown on the DNW as following Fig.35

Figure 35


DNW v0.60C - For WinCE [COM1,115200bps][USB:x][ADDR:0x30000000]
Serial Port USB Port Configuration Help
PAGES_PER_BLOCK = 64
SECTORS_PER_PAGE = 4
NUMBLOCKS : 4096(0x1000), SECTORSPERBLOCK = 64(0x40), BYTESPERSECTOR = 2048 (0x800)
NUMBLOCKS : 4096(0x1000), SECTORSPERBLOCK = 64(0x40), BYTESPERSECTOR = 2048 (0x800)
wNUM_BLOCKS : 4096(0x1000)
Press [ENTER] to launch image stored on boot media, or [SPACE] to enter boot monitor.
Initiating image launch in 2 seconds.
Ethernet Boot Loader Configuration:
0) IP address: 192.168.0.5
1) Subnet mask: 255.255.255.0
2) DHCP: Disabled
3) Boot delay: 2 seconds
4) Reset to factory default configuration
5) Startup image: LAUNCH EXISTING
6) Program disk image into SmartMedia card: Enabled
7) Program CS8900 MAC address (00:00:00:00:00:00)
8) KITL Configuration: ENABLED
9) Format Boot Media for BinFS

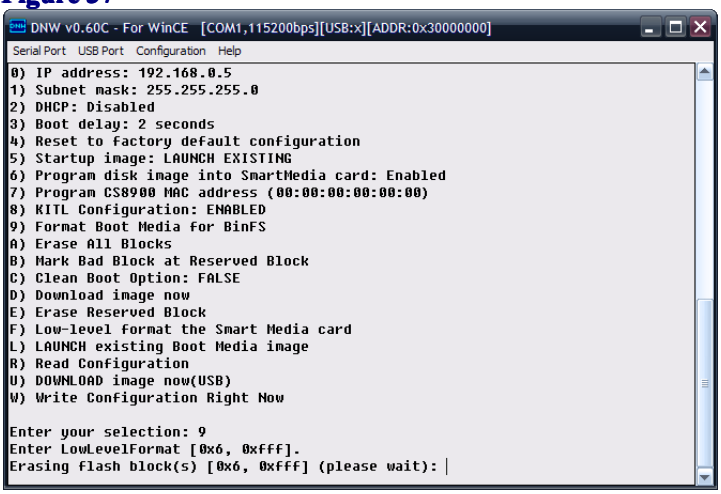
2) When 'Initiating image download in 5 seconds' characters appear, quickly push the space key on the keyboard, and enter the EBOOT program as follows

Figure 36


DNW v0.60C - For WinCE [COM1,115200bps][USB:x][ADDR:0x30000000]
Serial Port USB Port Configuration Help
Ethernet Boot Loader Configuration:
0) IP address: 192.168.0.5
1) Subnet mask: 255.255.255.0
2) DHCP: Disabled
3) Boot delay: 2 seconds
4) Reset to factory default configuration
5) Startup image: LAUNCH EXISTING
6) Program disk image into SmartMedia card: Enabled
7) Program CS8900 MAC address (00:00:00:00:00:00)
8) KITL Configuration: ENABLED
9) Format Boot Media for BinFS
A) Erase All Blocks
B) Mark Bad Block at Reserved Block
C) Clean Boot Option: FALSE
D) Download image now
E) Erase Reserved Block
F) Low-level format the Smart Media card
L) LAUNCH existing Boot Media image
R) Read Configuration
U) DOWNLOAD image now(USB)
W) Write Configuration Right Now
Enter your selection:

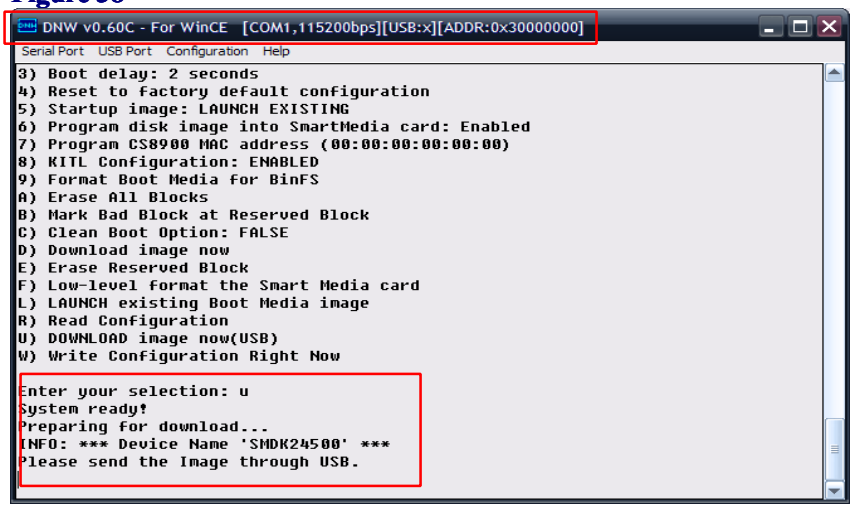
3) In 'Enter your selection:' command line, push '5' and '6' digital key on the keyboard respectively, make sure the No.5 and No.6 of the EBOOT program is the same with above Fig. Then push '9' to format the NAND flash on the baseboard

Figure 37


DNW v0.60C - For WinCE [COM1,115200bps][USB:x][ADDR:0x30000000]
Serial Port USB Port Configuration Help
0) IP address: 192.168.0.5
1) Subnet mask: 255.255.255.0
2) DHCP: Disabled
3) Boot delay: 2 seconds
4) Reset to factory default configuration
5) Startup image: LAUNCH EXISTING
6) Program disk image into SmartMedia card: Enabled
7) Program CS8900 MAC address (00:00:00:00:00:00)
8) KITL Configuration: ENABLED
9) Format Boot Media for BinFS
A) Erase All Blocks
B) Mark Bad Block at Reserved Block
C) Clean Boot Option: FALSE
D) Download image now
E) Erase Reserved Block
F) Low-level format the Smart Media card
L) LAUNCH existing Boot Media image
R) Read Configuration
U) DOWNLOAD image now(USB)
W) Write Configuration Right Now
Enter your selection: 9
Enter LowLevelFormat [0x6, 0xfff].
Erasing flash block(s) [0x6, 0xfff] (please wait):

4) In 'Enter your selection:' command line, push 'U' on the keyboard and start to load the images from PC by the USB cable as follows:

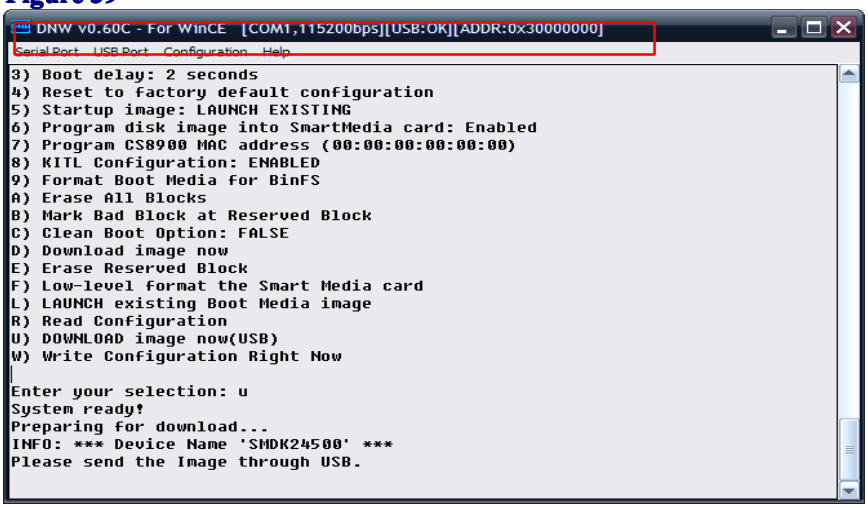
Figure 38


DNW v0.60C - For WinCE [COM1,115200bps][USB:x][ADDR:0x30000000]
Serial Port USB Port Configuration Help
3) Boot delay: 2 seconds
4) Reset to factory default configuration
5) Startup image: LAUNCH EXISTING
6) Program disk image into SmartMedia card: Enabled
7) Program CS8900 MAC address (00:00:00:00:00:00)
8) KITL Configuration: ENABLED
9) Format Boot Media for BinFS
A) Erase All Blocks
B) Mark Bad Block at Reserved Block
C) Clean Boot Option: FALSE
D) Download image now
E) Erase Reserved Block
F) Low-level format the Smart Media card
L) LAUNCH existing Boot Media image
R) Read Configuration
U) DOWNLOAD image now(USB)
W) Write Configuration Right Now
Enter your selection: u
System ready!
Preparing for download...
INFO: *** Device Name 'SMDK24500' ***
Please send the Image through USB.

5) Plug the USB cable into the J12 connector on the board and connect it with your computer. The PC system will quickly indicate you have to install the USB driver. Select the DNW USB Download Firmware folder and install the USB driver on your computer rightly.
(Note! This USB Download Firmware only support Windows XP system)

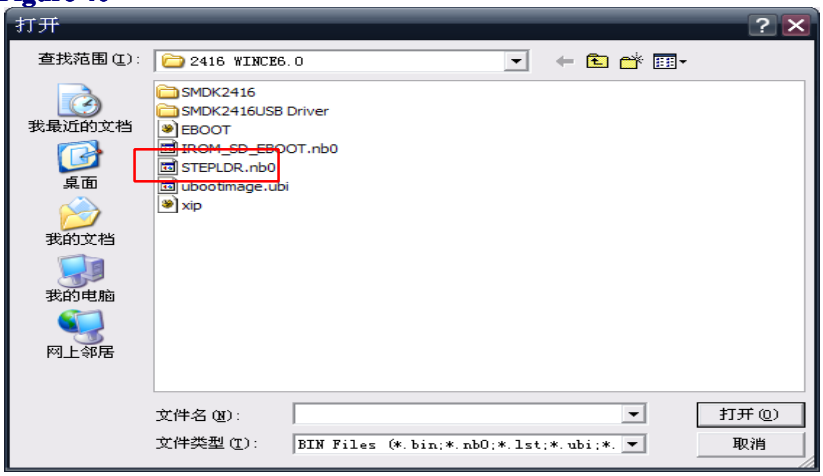
6) Once the USB driver is install rightly, the DNW menu will indicate USB connection status is 'OK as follows:

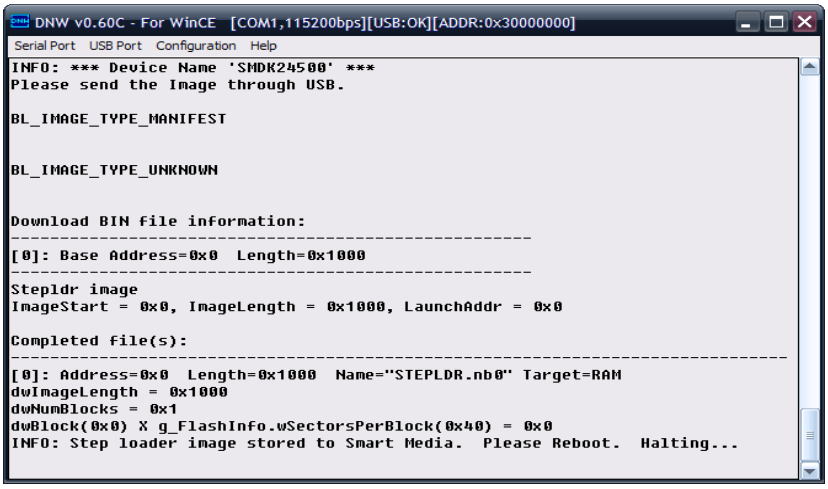
Figure 39


DNW V0.60C - For WinCE [COM1,115200bps][USB:OK][ADDR:0x30000000]
Serial Port USB Port Configuration Help
3) Boot delay: 2 seconds
4) Reset to factory default configuration
5) Startup image: LAUNCH EXISTING
6) Program disk image into SmartMedia card: Enabled
7) Program CS8900 MAC address (00:00:00:00:00:00)
8) KITL Configuration: ENABLED
9) Format Boot Media for BinFS
A) Erase All Blocks
B) Mark Bad Block at Reserved Block
C) Clean Boot Option: FALSE
D) Download image now
E) Erase Reserved Block
F) Low-level format the Smart Media card
L) LAUNCH existing Boot Media image
R) Read Configuration
U) DOWNLOAD image now(USB)
W) Write Configuration Right Now
Enter your selection: u
System ready!
Preparing for download...
INFO: *** Device Name 'SMDK24500' ***
Please send the Image through USB.

7) In the menu click [USB Port->UBOOT], select the STEPLDR.bin in the WINCE images folder and load it on the baseboard:

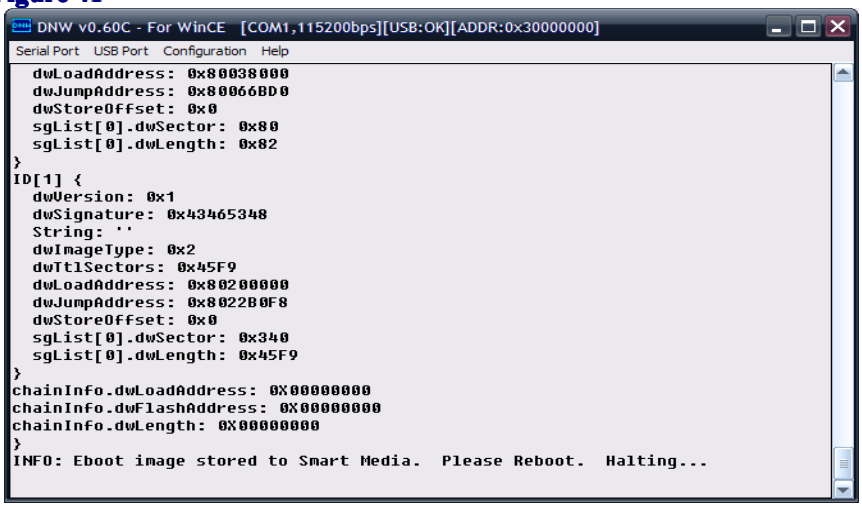
Figure 40




DNW v0.60C - For WinCE [COM1,115200bps][USB:OK][ADDR:0x30000000]
Serial Port USB Port Configuration Help
INFO: *** Device Name 'SMDK24500' ***
Please send the Image through USB.
BL_IMAGE_TYPE_MANIFEST
BL_IMAGE_TYPE_UNKNOWN
Download BIN file information:
[0]: Base Address=0x0 Length=0x1000
Stepldr image
ImageStart = 0x0, ImageLength = 0x1000, LaunchAddr = 0x0
Completed file(s):
[0]: Address=0x0 Length=0x1000 Name="STEPLDR.nb0" Target=RAM
dwImageLength = 0x1000
dwNumBlocks = 0x1
dwBlock(0x0) X g_FlashInfo.wSectorsPerBlock(0x40) = 0x0
INFO: Step loader image stored to Smart Media. Please Reboot. Halting...

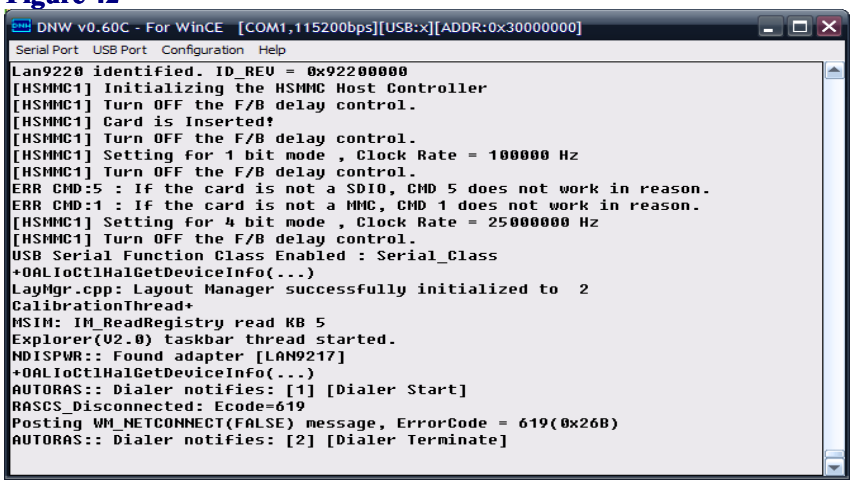
8) The SD-card Bootloader IROM_SD_EBOOT.nb0 will load it into the first block of the NAND flash.
9) Restart the board by the power cable and enter the EBOOT menu again, Push 'U' to download the EBOOT.bin file into the NAND flash as follows

Figure 41



10) Reboot the board again and enter the EBOOT menu, push 'U' to download the XIP.bin and load it into the NAND flash. Once the load procedure is end, the system will be boot automatically as follows

Figure 42


DNW v0.60C - For WinCE [COM1,115200bps][USB:x][ADDR:0x30000000]
Serial Port USB Port Configuration Help
Lan9220 identified. ID_REV = 0x92200000
[HSMMC1] Initializing the HSMMC Host Controller
[HSMMC1] Turn OFF the F/B delay control.
[HSMMC1] Card is Inserted!
[HSMMC1] Turn OFF the F/B delay control.
[HSMMC1] Setting for 1 bit mode , Clock Rate = 100000 Hz
[HSMMC1] Turn OFF the F/B delay control.
ERR CMD:5 : If the card is not a SDIO, CMD 5 does not work in reason.
ERR CMD:1 : If the card is not a MMC, CMD 1 does not work in reason.
[HSMMC1] Setting for 4 bit mode , Clock Rate = 25000000 Hz
[HSMMC1] Turn OFF the F/B delay control.
USB Serial Function Class Enabled : Serial_Class
+OALIoCtlHalGetDeviceInfo(...)
LayMgr.cpp: Layout Manager successfully initialized to 2
CalibrationThread+
MSIM: IM_ReadRegistry read KB 5
Explorer(V2.0) taskbar thread started.
NDISPWR:: Found adapter [LAN9217]
+OALIoCtlHalGetDeviceInfo(...)
AUTORAS:: Dialer notifies: [1] [Dialer Start]
RASCS_Disconnected: Ecode=619
Posting WM_NETCONNECT(FALSE) message, ErrorCode = 619(0x26B)
AUTORAS:: Dialer notifies: [2] [Dialer Terminate]

11) There are two methods to boot the WINCE kernel from the NAND flash: one is from the SD-card, the other is from the NAND flash. The method can be selected by setting the S1/S2 jumpers.

8.3 Make the WINCE Images

8.3.1 Step1 – Establish the WINCE Development Environment

Before this section start, Make sure you have installed the VS2005 and Windows Embedded CE 6.0 development environment on your computer. The whole WINCE 6.0 development environment includes following tools

Table 44 WINCE 6.0 development environment software

Name	Website
VS2005 demo version	http://download.microsoft.com/download/e/1/4/e1405d9e-47e3-404c-8b09-489437b27fb0/En_vs_2005_Pro_90_Trial.img
VS2005 Service Pack1 (VS80sp1-KB926601-X86-ENU.exe)	http://www.microsoft.com/downloads/details.aspx?familyid=bb4a75ab-e2d4-4c96-b39d-37baf6b5b1dc&displaylang=en
Visual Studio 2005 Service Pack 1 Update for Windows Vista/WIN7 (VS80sp1-KB932232-X86-ENU.exe)	http://www.microsoft.com/downloads/details.aspx?FamilyID=90E2942D-3AD1-4873-A2EE-4ACC0AACE5B6&displaylang=en
Visual Studio 2005 Service Pack 1 ATL Security Update (VS80sp1-KB971090-X86-INTL.exe)	http://www.microsoft.com/downloads/details.aspx?familyid=7C8729DC-06A2-4538-A90D-FF9464DC0197&displaylang=en
Windows Embedded CE 6.0 demo version	http://www.microsoft.com/downloads/details.aspx?displaylang=en&FamilyID=7e286847-6e06-4a0c-8cac-ca7d4c09cb56
Windows Embedded CE 6.0 Platform Builder Service Pack 1	http://www.microsoft.com/downloads/details.aspx?FamilyId=BF0DC0E3-8575-4860-A8E3-290ADF242678&displaylang=en
Windows Embedded CE 6.0 R2	http://www.microsoft.com/downloads/details.aspx?FamilyId=F41FC7C1-F0F4-4FD6-9366-B61E0AB59565&displaylang=en
Windows Embedded CE 6.0 R3	http://www.microsoft.com/downloads/details.aspx?FamilyID=BC247D88-DDB6-4D4A-A595-8EEE3556FE46&displaylang=ja&displaylang=en
Windows Embedded CE 6.0 for ARM pack (WinCEPB60-101231-Product-Update-Rollup-Armv4I.msi)	http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=1127

More details about installing procedure, please refer to some documentations from Microsoft website or MSDN help document.

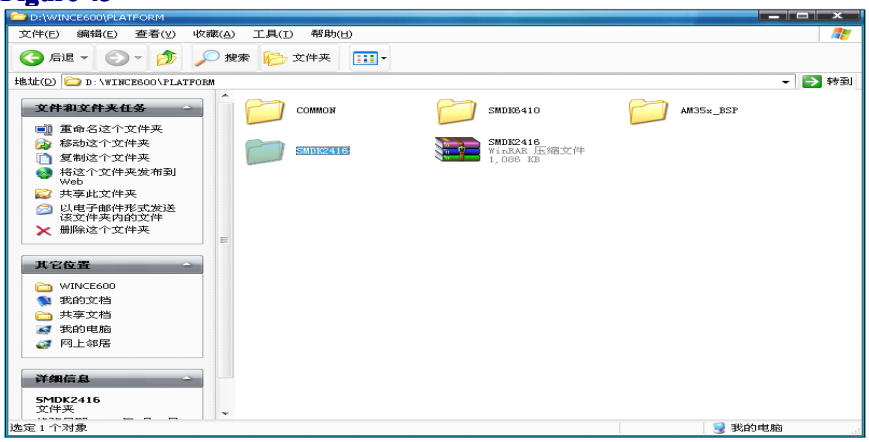
8.3.2 Get the BSP

The WINCE 6.0 BSP package can be download from IndusTech website:
http://www.industech.com.cn/s2416/wince.html

8.3.3 Create a New Platform.

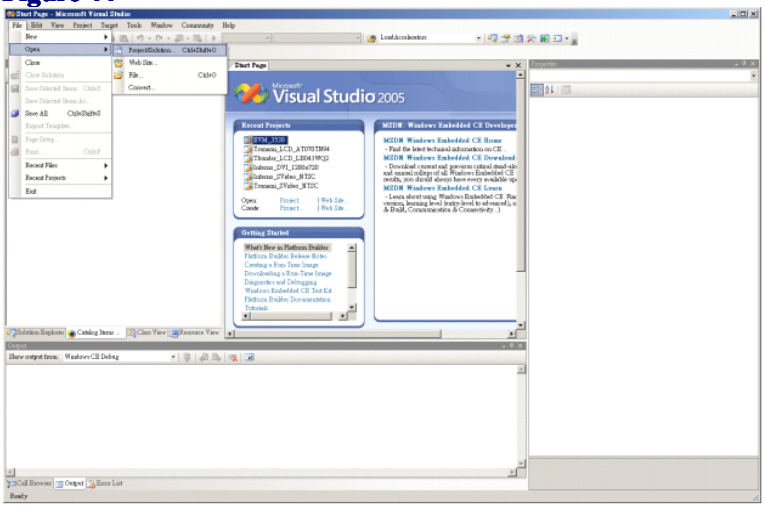
1) Copy the BSP: SMDK2416.rar file to D:/WINCE600/PLATFORM/ path and unzip it

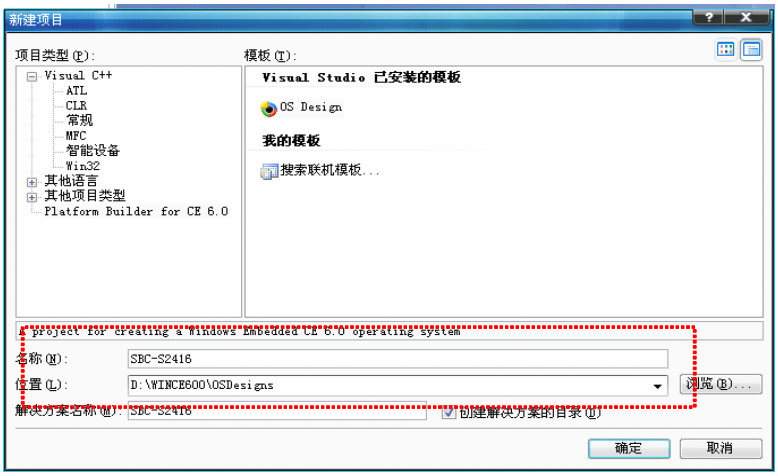
Figure 43



2) Open the 'Microsoft Visual Studio 2005' program and create a new platform builder project as follows:
Microsoft Visual Studio 2005->File->New->Project->Other Project Type->Platform Builder for CE 6.0
Project Name: SBC-S2416
Path: D:/WINCE600/OSDesigns/

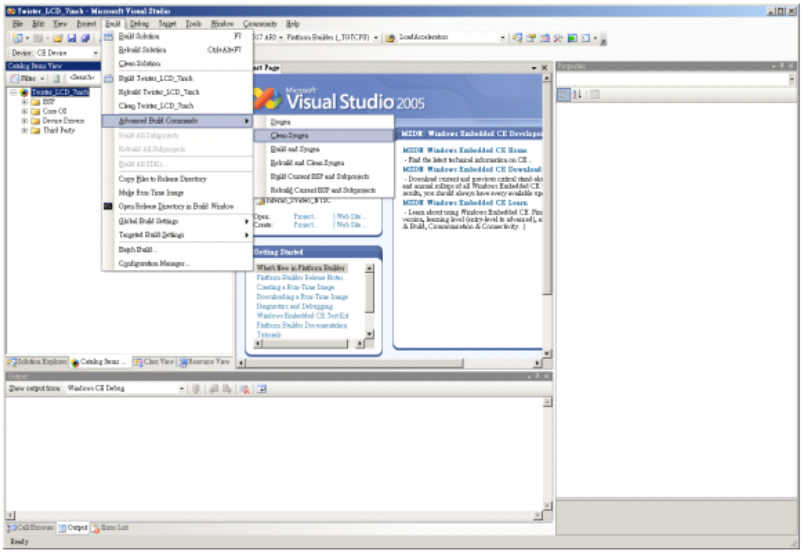
Figure 44





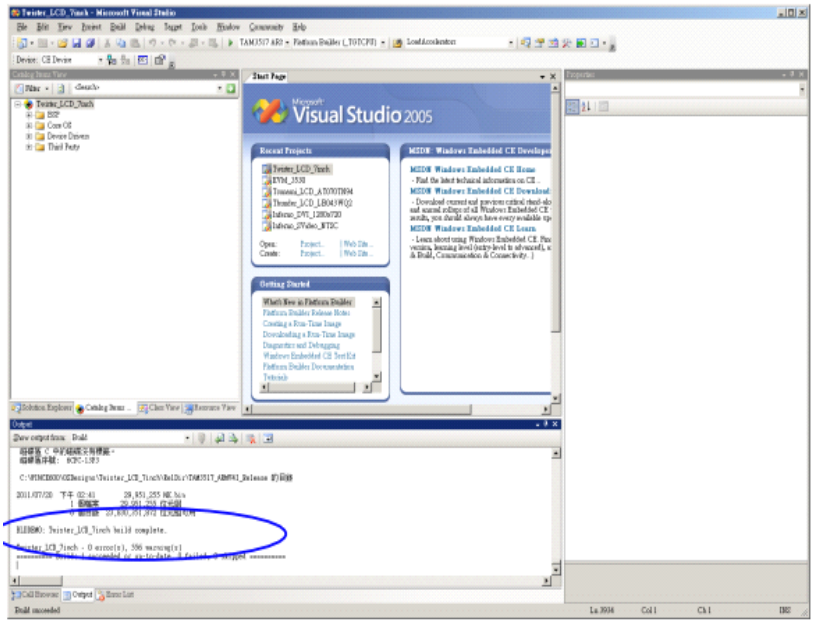
3) Click 'OK' to save this project, then start to set the configuration parameters according with design wizard until finish it.
4) Select submenu [Build-> Global Build Settings]
   - Copy Files to Release Directory After Build
   - Make Run-Time Image After build
5) If KITL is needed, set Enable Kernel Debugger and Enable KITL into Build Options page [Project-> Properties].
6) In the menu click [build/advanced build command/Clean Sysgen] (See figure 45), this will take approximately 20 minutes, after which you will see "build complete"

Figure 45



7) Images including XIP.bin, EBOOT.bin, STEPLDR.bin and IROM_SD_EBOOT.nb0 and so on will be generated; You can copy these files in the WINCE image file folder and update it (see figure 46).

Figure 46



8.3.4 System Customization.

Windows Embedded CE 6.0 consists of a number of independent modules. Each module provides specific functions, of which some modules can be divided into several components. Each component has specific feature, making OEM/ODM customize a stable and efficient version according to specific application. Taking Mobile Handheld as a template, sample SBC-S2416 OS image adds features of components including:

Table 45 WINCE 6.0 Components Customization

Components Name	Location
ActiveSync	Core OS->CEBASE->Application – End User
CAB File installer/uninstaller	Core OS->CEBASE->Applications-End User
OS Dependencies for .NET Compact Framework 3.5	Core OS->CEBASE->Applications and Services Development->.NET Compact Framework 3.5
Point-to-Point Protocol over Ethernet (PPPoE)	Core OS->CEBASE->Communication Services and Networking->Networking – Wide Area Network (WAN)
USB Function Driver	Core OS->CEBASE->Core OS Services->USB Host Support
USB Host Support	Core OS->CEBASE->Core OS Services->USB Host Support
USB Human Input Device (HID) Class Driver	Core OS->CEBASE->Core OS Services->USB Host Support
USB HID Keyboard and Mouse	Core OS->CEBASE->Core OS Services->USB Host Support-> USB Human Input Device (HID) Class Driver
USB Storage Class Driver	Core OS->CEBASE->Core OS Services->USB Host Support
RAM and ROM File System	Core OS->CEBASE->File Systems and Data Store->File System – Internal (Choose 1)
Hive-based Registry	Core OS->CEBASE->File Systems and Data Store->Registry Storage – Internal (Choose 1)
exFAT File System	Core OS->CEBASE->File Systems and Data Store->Storage Manager

FAT File System	Core OS->CEBASE->File Systems and Data Store->Storage Manager
Storage Manager Control Panel Applet	Core OS->CEBASE->File Systems and Data Store->Storage Manager
Transaction-Safe FAT File System (TFAT)	Core OS->CEBASE->File Systems and Data Store->Storage Manager
Video/Image Compression Manager	Core OS->CEBASE->Graphics and Multimedia Technologies->Media->Video Codecs and Renderers
Console Window	Core OS->CEBASE->Shell and User Interface->Shell->Command Shell
SD Memory	Device Drivers->SDIO->SDIO Memory
serial	Device Drivers->USB Function->USB Function Clients
Windows Embedded CE Test Kit	Device Drivers

Components can be added or deleted in window Catalog Items View of Visual Studio 2005(VS2005) integrated development environment

8.4 HOW TO

8.4.1 How to Change The LCD Parameters

In the factory, the LCD parameters are pre-set as the 7 inch LCD. You have to change the macro definition in the bsp_cfg.h header file. The path is:

SMDK2416/SRC/ INC/

In the final line of this header file, the LCD_MODULE_TYPE macro is pre-defined as follows:

```
#define LCD_MODULE_TYPE     LCD_MODULE_LW500AC9601
```

You can change this macro and define other parameters such as:

```
#define LCD_MODULE_AT043TN13    //4.3 inch LCD, 480x272
#define LCD_MODULE_N101L6    //10.1 inch LCD, 1024x600
#define LCD_MODULE_VGA800600   //VGA out, 800x600
#define LCD_MODULE_121              //12.1 inch LCD, 1024x768
```

After changing this macro, re-compile the WINCE BSP and update following the WINCE images into the NAND flash: 'IROM_SD_EBOOT.nb0', 'EBOOT.bin' and 'XIP.bin'

8.4.2 How to Install the SDK

The SBC-S2416 baseboard SDK of WINCE 6.0 is placed in the SMDK2416/SDK/ file folder, you have to install it firstly before you want to develop application based on the VS2005/2008 or eVC. Double-click the 'SBC_S2416_SDK.msi' program and install it with the wizard. Certainly, you can export the new SDK in the platform builder when your new component drivers have been developed. More details, please refer to the MSDN documents about your development environment.

8.4.3 How to Test Ports On The WINCE

1) Serial Test

SBC-S2416 baseboard includes four COM ports. Once the WINCE OS is on, you have to use the serials by the serial demo application if your application has no any serial test function. The serial demo application is located in the SMDK2416/SRC/APPS/SerialPort/ file folder. You can compile it by the VS2008 compiling tools based on the SBC-S2416 CE 6.0 SDK, the SerialPort.exe program will be generated. You can copy it into the baseboard by the SD-card or ActiveSync on-line debug function and test serial ports.

2) GPIO Test

SBC-S2416 baseboard includes eight GPIOs. Once the WINCE6.0 OS is on, you can't directly access the GPIO physical address except for GPIO driver. The BSP provides GPIO driver and demo application. The demo application is located in the SMDK2416/SRC/APPS/GPIODemo/ file folder. You can refer and compile it by the VS2008 platform builder. When the GPIODemo.exe program is generated, you can copy it by the SD-card or ActiveSync on-line debug function into the SBC-S2416 and test eight GPIOs. Anyway, the GPIO demo application only provide GPIO output function (high-level or low-level), the input capture is not included here.

3) LED Test

SBC-S2416 baseboard includes two LEDs, one is on the CoM-S2416, the other is on the baseboard. Once the WINCE6.0 OS is on, you can't directly access the LED physical address except for LED driver.

The BSP provides LED driver and demo application. The demo application is located in the SMDK2416/SRC/APPS/LEDDemo/ file folder. You can refer and compile it by the VS2008 platform builder. When the LEDDemo.exe program is generated, you can copy it by the SD-card or ActiveSync on-line debug function into the SBC-S2416 and test LED status: ON or OFF.

4) PWM Test

SBC-S2416 baseboard includes PWM test function. The BSP provides PWM driver and demo application. The demo application is located in the SMDK2416/SRC/APPS/PWMDemo/ file folder. You can refer and compile it by the VS2008 platform builder. When the PWM.exe program is generated, you can copy it by the SD-card or ActiveSync on-line debug function into the SBC-S2416 and test PWM output. Anyway, the SBC-S2416 baseboard only provides one PWM tune that drives the backlight of the LCD. Please refer to baseboard schematic about more details.

5) Recorder Test

SBC-S2416 baseboard includes MIC input port. The BSP provides audio codec driver and recorder demo application. The demo application is located in the SMDK2416/SRC/APPS/Recorder/ file folder. You can refer and compile it by the VS2008 platform builder. When the recorder.exe program is generated, you can copy it by the SD-card or ActiveSync on-line debug function into the SBC-S2416 and test MIC input.

6) Watchdog Test

SBC-S2416 baseboard includes watchdog function. Once the WINCE6.0 OS is on, you can't directly access the watchdog physical address except for watchdog driver. BSP provides watchdog driver and demo application. The demo application is located in the SMDK2416/SRC/APPS/WatchdogDemo/ file folder. You can refer and compile it by the VS2008 platform builder. When the watchdogdemo.exe program is generated, you can copy it by the SD-card or ActiveSync on-line debug function into the SBC-S2416 and test watchdog function. Anyway, the watchdog function is only included in the CoM-S2416 V1.0 board.